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JOURNAL OF
Agriculture
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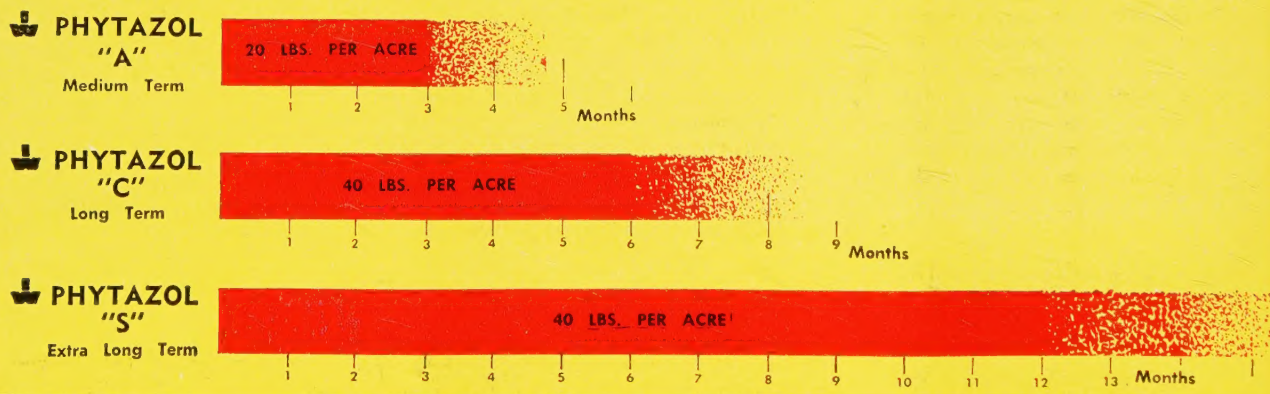


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[D. G. Jardine

There is not much scope for transport of produce on inland waterways in New Zealand, generally because of their unsuitability for navigation. However, s.s. Earnslaw, shown loading wool on our cover this month, provides a vital link for the small communities living on sheep stations that fringe Lake Wakatipu. At holiday seasons her decks are lined with sightseers making trips to Kinloch and Glenorchy at the head of the lake.

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Is

Artificial Breeding

Risky?

By C. P. McMEEKAN,
Superintendent, Department of Agriculture's Ruakura Animal Research Station

WIDESPREAD interest among breeders of pedigree cattle and commercial dairymen was created by two addresses at the recent Jersey Breeders' Conference at Ruakura Animal Research Station. Dr Alan Stewart, Principal of Massey Agricultural College and until recently head of the Technical Services of the British Milk Marketing Board, strongly advocated the use of artificial insemination by pedigree breeders as a means of making more effective use of top quality stud sires whose contributions to the breed at present are severely restricted by the size of the herds in which they are working. The author of this article forecast the universal adoption of artificial breeding in New Zealand in commercial dairying and argued that in such a situation there was little future for the breed society as it had existed to date. He suggested that to survive, pedigree breeders would have to adopt the same principles in the improvement of their cattle as those behind the artificial breeding system. While both points of view received a considerate hearing, many fears were expressed by prominent breeders who, in particular, raised the question of deterioration of cattle stocks through in-breeding as a real risk.

A MONOGRAPH just published privately by the British Milk Marketing Board is devoted almost exclusively to this latter possibility. The major points made are of sufficient importance to be worth summarising for the benefit of the dairymen interested in the welfare of New Zealand cattle. English breeders have similar fears, and in an attempt to obtain as much information as possible on the subject Dr Joseph Edwards, who heads the herd improvement work of Britain, referred the question to 12 world authorities in the science and practice of genetics.

Dr Edwards treated the problem in this way: he pointed out that the present plans of the Milk Marketing Board envisage the breeding of 2 million dairy cattle annually to 200 sires of known breeding merit and asked whether this can be achieved without genetic deterioration. Specifically he inquired whether there are any grounds substantiated by modern

concepts and experiments in quantitative genetics or by experiences in nature for doubting the proposition that such a large number of female animals can be bred successfully to such a small number of males without degeneration. What were the replies?

Only a short precis can be given in this article, and interested readers are referred to the monograph for the complete story.

★ ★ ★

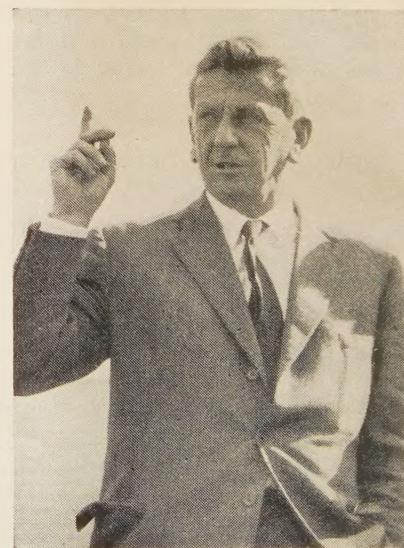
Dr N. D. Bayley, head of the Breeding and Management Section at Beltsville, U.S.A., considers the proposal to have no serious loopholes. He further points out that the scheme is essentially similar to that in force through the American Breeders' Service, which in 1958 bred over 1 million cows to approximately 100 bulls, and adds that if there was anything to worry about, they would be worrying about it themselves. He suggests that the only real risk is to the smaller breeds, in respect of which special precautions have to

Advocates A.B. for
pedigree herds . . .



Dr Alan Stewart, Principal of Massey Agricultural College.

Forecasts universal
adoption of A.B. in
commercial dairying . . .



Dr C. P. McMeekan, Superintendent, Ruakura Animal Research Station.

be taken if they are to be kept as pure breeds.

★ ★ ★
Professor C. D. Darlington, of the University of Oxford, believes that any dangers will be encountered first in the smaller breeds and that special precautions should be taken in handling these. Such special precautions would involve test matings of closely related individuals and a selection of the breeding sires used from test-bred animals.

★ ★ ★
Dr D. S. Falconer, of the Animal Genetics Institute, Edinburgh, replies by pointing out that the theoretical rate of in-breeding in the system proposed would be 0.0625 per cent per generation and that based on British studies the in-breeding decline of milk yield is 0.32 per cent of the original yield for every 100 per cent increases of the in-breeding coefficient.

He mentions that seven other commercial characters in pigs, sheep, and chickens show rates of decline ranging from 0.13 to 0.64 per cent, so that some confidence can be placed in the figure

A.B. bulls at the New Zealand Dairy Board's Artificial Breeding Centre at Newstead, near Hamilton.

for milk yield as being of the right order. To be on the safe side, and increasing the figure to 0.5 per cent as the expected decline in economic value, Dr Falconer then calculates that the likely decline would be 0.03 per cent per generation or 0.6 per cent per century. In other words, for every £100 of original economic return today there is likely to be a drop of 12s. in a century—a figure surely completely negligible in comparison with the expected gain from selection.

Dr Falconer considers, however, that the inclusion of a system of back-crossing with the proven bulls of each year to their daughters would be desirable to reveal the presence of really harmful defects.

★ ★ ★
Dr John Hammond, of Cambridge University, sees no harm in the scheme provided the needs of minor breeds are looked after by having a rather higher proportion of bulls. Dr Hammond also favours the idea of back-crossing to daughters to detect any basic weaknesses in constitution or the existence of actual defects.

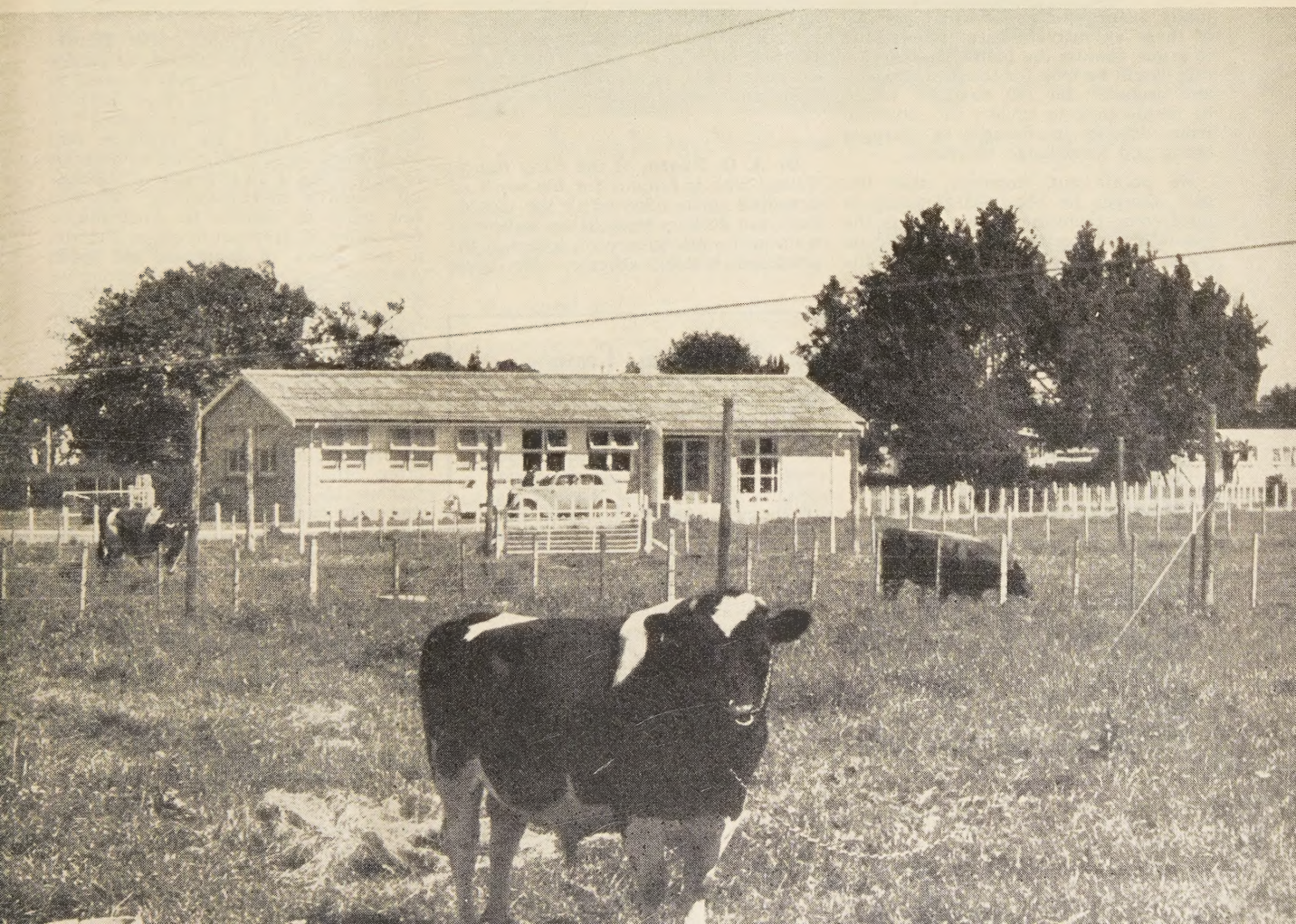
★ ★ ★
Dr Arthur Hansson, of the Animal Breeding Institute of Sweden, on the

OPINIONS ON A.B.

other hand, considers that though the proposal will most likely lead to a significantly increased rate of improvement in production characters, genetic deterioration may be the main consequence in the far distant future. He argues that the preservation of the genetic variation in our farm animals is of prime importance, but believes that provided deep freezing of semen is effectively used, genetic variation could be protected by the use of such stored genetic variation, which can be called on at any moment to restore any harmful situation.

★ ★ ★
Professor Ivan Johansson, of the University of Uppsala, Sweden, concludes that even if the number of bulls used for A.I. breeding is reduced as low as 10 or 20 within a breed, the risk of deterioration through in-breeding is rather small when long-term mating is practised, and this risk can be further decreased by planned breeding. Professor Johansson does not consider that the testing of young bulls for lethal genes is necessary and believes that it should be sufficient to exclude all bulls which have produced lethal or otherwise abnormal calves.

★ ★ ★



IS ARTIFICIAL BREEDING RISKY? . . .

Dr J. E. Legates, Geneticist of the University of North Carolina, sees no genetical reason why the programme should not be undertaken. He argues that the system should improve the genetic mean of the population substantially, but feels that the genetic variability in the population of 2 million cows will not be altered markedly, so that the "point of no return" in the next 50 years or so is most unlikely to be reached.

In support of this view he argues that many pedigree breeders will continue to assemble herds and shortly thereafter to disperse them, thus leaving a segment of pedigree cattle outside the programme essentially undisturbed. He finally makes the important point that the fact that semen is now available from many foreign sources provides an insurance policy, should it ever be necessary to return to or approach the original starting point.

★ ★ ★

Professor J. L. Lush, of Ames, Iowa, who has, perhaps, done more than any other living man to establish the science of population genetics, says that the risks of any genetic damage through trying as few as 1,000 young bulls each generation and eventually using the apparently best 200 of these extensively seem too trifling to argue against the plan. He believes this would be true for the first 50 years and probably for 150, so there would be ample time to review the situation from decade to decade as changes occur and knowledge increases.

He points out, however, that the only danger he sees real enough to need some planning to avoid it is the possibility of getting too enthusiastic about the supposedly best of the

current sires when choosing the young bulls to test for the next generation. In an extreme case all of the new young bulls could be sired by only three or four of the current sires and this would narrow the genetic base of the population enough that some damage might be noticeable within 20 or 30 years. This, however, can be simply avoided by seeing that the 200 new bulls chosen each year for testing are by **many** of the current sires. Dr Lush is also conscious of the problem with breeds small in number, but considers that special arrangements could be safely made for such groups.

★ ★ ★

Professor K. Mather, Geneticist of the University of Birmingham, sees no reason for doubting that 200 bulls should be adequate subject to special provision for small groups like the Jersey (in England) and in the long run the provision of appropriate steps to avoid in-breeding in larger groups.

★ ★ ★

Dr J. M. Rendel, who leads animal breeding research in Australia, does not doubt that what is proposed is possible with proper precautions, but equally does not believe that all fears about in-breeding risks are groundless. Dr Rendel believes, however, that the risks can be minimised by subdivision of the population into "units" and drawing bulls to one unit from other units and not from within each.

★ ★ ★

Dr A. O. Rhoad, of the King Ranch, Texas, who is famous for his work on breeding cattle adapted to the tropics, does not fear genetic deterioration as a natural consequence of applying the proposed mating scheme. He bases

this view on his understanding of population genetics and directed evolution and his own experience of large populations of cattle. He believes the proposed plan not to be fantastic; he considers it sound technically and that its execution would bring animal breeding further into step with this marvellous age of technology in a country long renowned for its achievements in the breeding of livestock.

★ ★ ★

Dr Alan Robertson, of the Animal Genetics Institute, Edinburgh, sees no reason why the Milk Marketing Board should not concentrate its breeding policy as proposed and considers that the only critical factor is how the young bulls are bred. He points out that only when the influence of A.B. sires is so great that they father almost all the young bulls tested and almost all of their dams will care be needed. The Red Danish breed has reached this stage now and the situation there should be watched closely in the next few years.

★ ★ ★

None of these authorities commented on the last part of the specific question which asked whether there were any experiences in nature that suggested any grounds for fear. This question in consequence was referred especially to the well known naturalist Dr Maurice Burton of the "Illustrated London News".

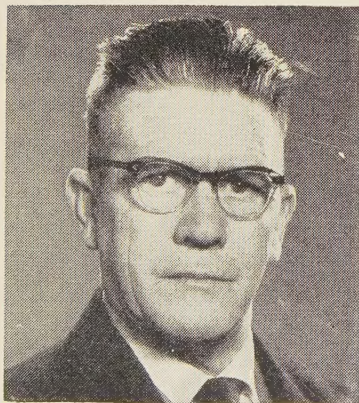
Among points made, Dr Burton mentions that all the millions of golden hamsters now kept as pets or used in laboratories came from one litter, a mother and 12 young taken in Palestine in 1930. He considers that the history of introductions of animals to new areas is an example of successful massive multiplication. Thus a few pairs of rabbits in Australia, a few pairs of grey squirrels in Britain, a few pairs of starlings in South America, and a few pairs of sparrows in the U.S.A., South Africa, and New Zealand have been sufficient to develop these species to vast proportions in these countries.

On the other side of the ledger he points out that there have been many illustrations of recoveries from the verge of extinction from but a few surviving individuals. Thus the sea otter, the Northern sea elephant (where in 1930 there were no cows and only two or three young animals beside the bulls), the southern sea elephant, the Asiatic lion, and the North American buffalo.

★ ★ ★

Summing up these views one cannot help being impressed by their unanimity, a situation which must encourage those interested in the further improvement of our dairy cattle by the present revolutionary methods.

Doctorate of Science for Work on Copper



DR I. J. CUNNINGHAM, who has been Assistant Director-General of Agriculture since October 1958 and before that was Superintendent of the Department of Agriculture's Wallaceville Animal Research Station, has been awarded a Doctorate of Science by the University of New Zealand for his work on copper metabolism in livestock. Much of Dr Cunningham's research has been devoted to the study of mineral deficiencies. His contributions to the understanding of the role of copper in animal metabolism are widely recognised and have done much to improve stock health in New Zealand.

Harvesting with a Bin on the Header

By L. H. WESTON,
Farm Advisory Officer (Machinery),
Department of Agriculture,
Dunedin

BULK harvesting of grain has many advantages. Only one man is required for the actual harvesting operation, to drive the tractor or the self-propelled machine. There is not the unpleasant job of sewing bags on a moving platform, and the harvesting speed is not limited by the capacity of the sewers. Furthermore, the harvested crop is not scattered over the paddock at the end of the day. No bags are required, but the farmer has either a big outlay in transporting equipment and storage bins or depends very much on the local carrier and the railways.

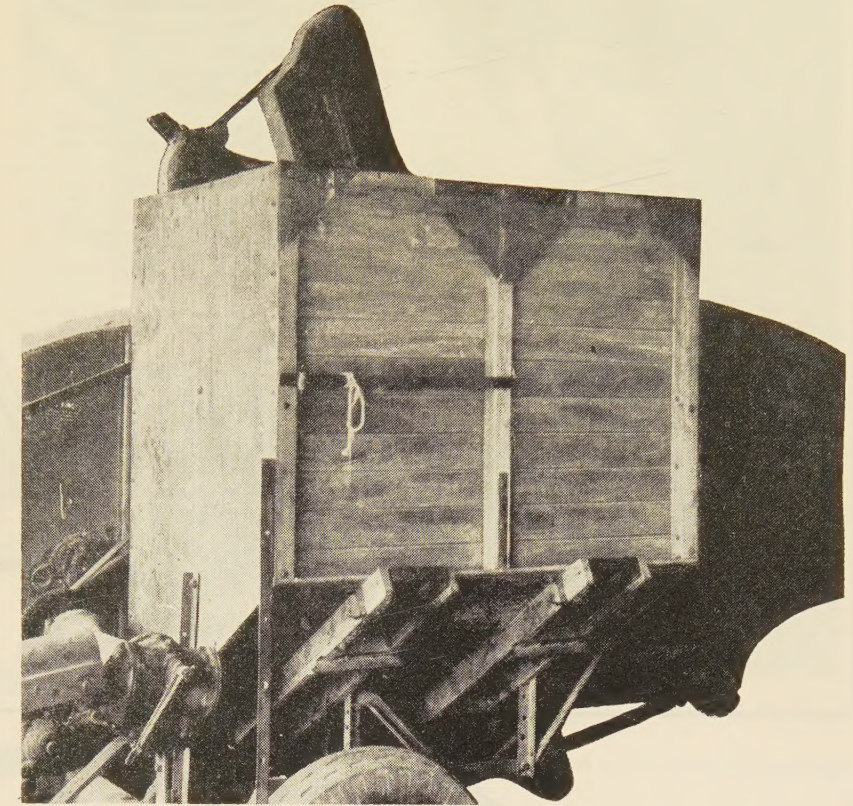
MOST of these advantages, with the few disadvantages, can be obtained by fitting a bulk bin to the header as shown in the photographs. Such a bin holding some 25 bushels, seven or eight bags, can be home made for a few pounds. It enables one man to harvest on his own if necessary; the bags can be sewn later. The bin is emptied into sacks at one convenient point where the harvested crop can be covered if it rains.

First Bin Designed

The farmers whose headers are illustrated worked for many years with one 6 ft header equipped with a bin. The header, working at full capacity of up to 100 bushels an hour, filled the bin in 15 minutes or so, and for much of the time the trips were short ones to the gateway. Here the second man helped empty the bin from its two slides. He then loose tied the bags and carted them into the shed. In favourable conditions three bin loads per hour could be obtained, faster than the normal harvesting rate if anything. At the end of the day all the harvested crop was under cover.

The illustration on this page shows the original box fitted on to the header 10 years ago. The system has proved so successful that three of the neighbours have adopted it. The box holds enough wheat to fill eight or nine bags, but generally less on hillsides.

The bottom of the box slopes 2 ft in 3 ft, making an angle of about



The first bin fitted holds enough wheat to fill eight or nine bags.

35 degrees. The screen can be left in position if desired and a partition placed across the box, separating about one-seventh of it off for the seconds.

The wheel and axle bearing capacities limit the size of box. The load of just under $2\frac{2}{3}$ ton can be supported on a 6 ft header without any difficulty. Actually, it is not much greater than the normal load on the platform. Bulk tanks for one make of header (5 ft) hold 32 bushels, but most bins of this type hold about 25 bushels (30 cub. ft.). A bulk bin could cost £80 or more, whereas boxes could be made up by a handyman for about one-tenth of this cost. One Oamaru farmer has already equipped his header with a manufactured grain tank in order to bag from a hopper in the paddock.

The position of the farmers using this system is unusual in that they own an old mill which they use to dress all harvested crops. This ensures a ready sale for their produce. The screen is not therefore required on the header.

Second Bin Fitted

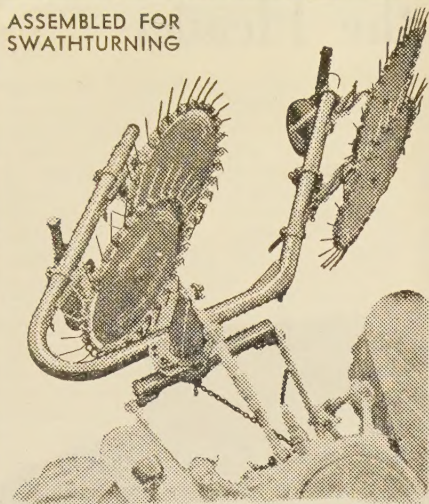
Three years ago these farmers bought another header, second hand, and equipped it with a bin, which is shown in the illustration on page 7. The bagging spouts on this bin are 3 ft 3 in. from the ground (one spout is incomplete). A sliding plate is sufficient to shut off the flow. The bags are held on two arms formed by bending out sections of angle iron. This method has been found more convenient than using hooks, which now are not necessary.

Construction

The platform support has been adapted to take the box, with a frame of $1\frac{1}{2} \times 1\frac{1}{2} \times \frac{1}{4}$ in. angle iron. The sides of the box are tongued and grooved flooring, nailed to frames of 2×2 in. dressed timber. The frames are bolted together with $\frac{3}{16}$ in.-diameter bolts. The end brace seen in the illustration is $\frac{3}{4} \times \frac{3}{4} \times \frac{1}{4}$ in. angle iron.

The sloping floor is strengthened with a 3×1 in. timber running lengthways underneath the centre, and this timber is held by $1\frac{1}{2} \times 1 \times \frac{1}{4}$ in. angle

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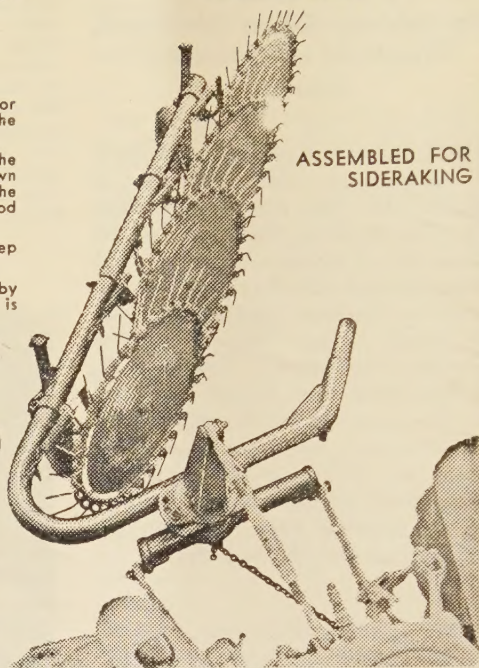
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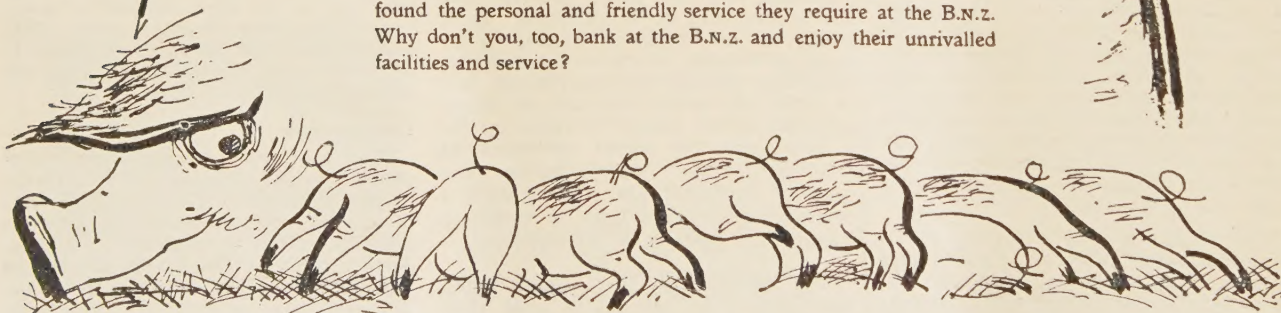
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iron ends bolted to the box. The upper and lower edges rest on the angle iron of the main frame.

This main frame of angle iron must be firmly braced at the back to prevent swaying. As an alternative to welding, medium weight (14 gauge) slotted steel angle ($2\frac{1}{2} \times 1\frac{1}{2}$ in.) could be assembled with bolts. In all, about 50 ft would be required, costing about £5.

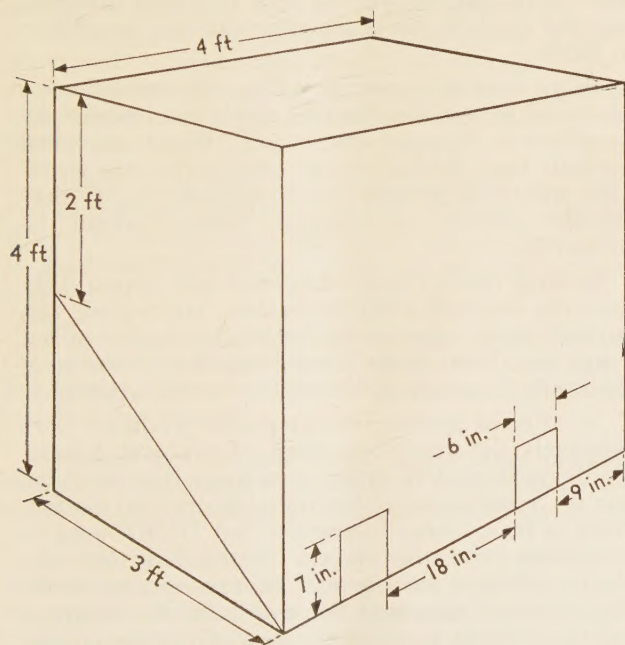
The essential measurements of this bin are shown in the diagram. Construction will not be difficult if the parts are measured up and fitted on as the work progresses.

Make the angle iron main frame first. Make sure that it is firmly attached and well braced to the old platform frame. Next, make up the sloping floor and the back. The side frames can then be measured up and built. When they are bolted on, the front can be made.

Note the angle iron above the bagging outlets. These openings are 7 in. high and 6 in. wide. Sheet metal (galvanised) of about 20 gauge is suitable for the slide and chute. The slide itself and its guides could be taken from the bagging attachment of the header.

The dimensions can be varied to suit the make of header. The framework must always be well braced, and the floor of the box well supported.

A section of transparent plastic along the top of the box in the front, replacing the top board for instance, would make it easier to see if the box was full. In all other respects these boxes made by the farmers are highly satisfactory.



Dimensions of the second bin.

HARVESTING WITH A BIN ON THE HEADER



The second bin. With two headers fitted with bins and only two men up to 60 bags of wheat an hour are harvested.

Advantages of Bins

With the two headers and only two men up to 60 bags an hour are harvested. The bags still have to be tied, carted in, and put through the mill, but when suitable harvesting weather is restricted this extra capacity and independence from outside labour are of great value. Harvesting continues well into the night if conditions are suitable.

Several neighbours have copied this system. Some without a mill to dress the seed have retained the screen on the header, and with these about a seventh of the bin is boarded off beside the rear emptying slide for the seconds of grain.

Summarised the method's advantages are:

Only one man is required for harvesting when bagging from a bin on the header.

If a second man is available, he can sew the bags and cart them in.

Harvesting may be faster because the header can work at full capacity, and sewing bags is easier and more pleasant on the ground. (Stops for unloading could be about five minutes if the bags are tied, 15 minutes or so if they are sewn with only one man harvesting, or less than five minutes with a second man sewing.)

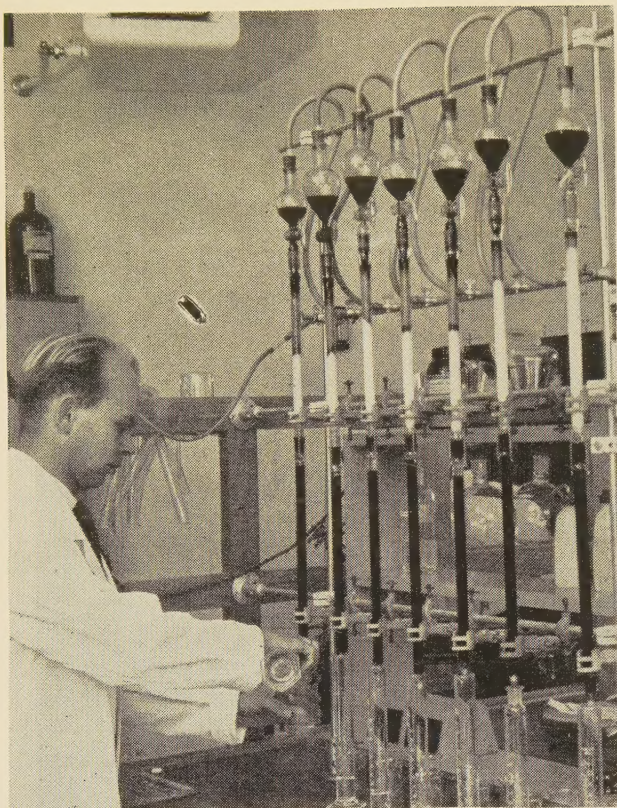
Bags are in one heap and can be quickly covered, or are carted in during harvesting by the second man.

Complete bulk handling and harvesting entail dependence on carriers and will require railway trucks or, possibly, an expensive bulk store and handling equipment.

Bagging from a header bin has merit on smaller farms where only one or two men are available.

ROUND THE RESEARCH STATIONS

Current Work and Findings in Department of Agriculture Trials and Experiments



Ruakura

High Potency of Facial Eczema Toxin

Research chemists in the facial eczema team at Ruakura have always been intrigued at the extraordinarily high potency of the facial eczema toxin.

Grass, as eaten by the sheep, even when highly toxic, contains no more than 1 oz of the toxin in approximately 27 tons of dried feed. Yet as little as 1 lb of such toxic grass consumed per day is sufficient to produce severe liver damage in an adult sheep.

Studies by Ruakura workers on the site of absorption of the toxin and its subsequent fate in the animal body have brought to light some interesting facts which may explain why it is so potent. These studies show that the toxin is taken with the feed into the bowel, from which it is absorbed into the bloodstream and carried directly to the liver. It is then passed into the bile circulation within the liver and flows out down the common bile duct back into the bowel. Here it is reabsorbed into the bloodstream and returned again to the liver.

It is believed the circulation of the toxin continues for some time, so that one minute dose can cause considerable damage to the bile duct system by repeated passage through it.

Wallaceville

Toxicity of DNBP to Cattle

After the first outbreak of mucosal disease in the Wairarapa in 1959 it was suspected that the weedkiller dinitro sec-butyl phenol (DNBP), which had been used earlier on a pea crop on the affected farm, might be responsible. At the time very little information was available about the effects of this weedkiller on cattle.

In an inquiry begun at Wallaceville nine heifers were used to test the effect of single fatal doses and the effects of repeated small doses. Blood was taken regularly from the heifers and analysed for the weedkiller and to see whether the blood abnormality consistently present in mucosal diseases could be produced.

In large enough single doses and with repeat daily doses the weedkiller did kill heifers, but a point was reached where repeat doses for 11 days had no effect. It was found that at the lower levels the heifers were apparently accustoming themselves to the weedkiller.

In affected heifers the symptoms produced were completely different from those of mucosal disease, and the post-mortem evidence in those that died also bore no resemblance to that found in mucosal disease. There is no evidence to suggest that DNBP used in accordance with the makers' instructions has any adverse effect on stock grazed later on sprayed areas. The poisonous nature of this weedkiller to operators, and the dangers to stock which might graze freshly sprayed crops, should be appreciated, however.

Invermay

Trials with Pasture Species

Pasture species which in trials at Invermay Research Station have shown promise in nursery areas and are being tested on a field scale include *Phalaris tuberosa*, *Bromus marginatus*, prairie grass, tall and meadow fescue, red and subterranean clover strains, and chicory.

Phalaris tuberosa has shown some promise, particularly under high fertility conditions, but suffers from the competition of weed grasses and generally has proved inferior to cocksfoot under similar conditions. Its winter production, though good, is inferior to that from short-rotation ryegrass, and its summer production is inferior to that of cocksfoot. A major disadvantage is its lack of palatability.

Bromus marginatus and prairie grass have shown possibilities as companion grasses for lucerne and for special-purpose pastures. The winter and overall yearly production of these species is very good and the herbage is readily consumed by sheep and cattle. However, they cannot be used in a general-purpose sheep pasture, as they will not withstand continuous grazing.

Tall fescue is sometimes sown in England as a companion grass with lucerne. The S170 strain has proved very promising in lucerne-grass mixtures trials at Invermay. It has been one of the most productive grasses sown with lucerne and is less severe in its suppression effects than either cocksfoot or ryegrass.

Meadow fescue also has shown some promise, particularly with lucerne, but its production under grazing is generally inferior to that of ryegrass. It is not an aggressive species and is incapable of competing with browntop and other weed grasses. However, it is palatable and combines well with timothy and lucerne where its non-aggressive nature is an advantage.

Strain trials with red clover indicate that the production and persistence of New Zealand certified strains of Montgomery red clover and cowgrass are as good as or superior to those of overseas strains tried.

The best of several subterranean clover strains for winter production under both low and high fertility conditions have been Mt. Barker, Tallarook, and Bacchus Marsh.

Granger and Cascade *Lotus* strains have proved superior to the commercial strains of *Lotus uliginosus* and *Lotus corniculatus*, particularly in production.

Chicory has proved one of the most productive species in nursery trial areas and has been outstanding during summer drought conditions. It is now being tested on a more extensive scale in general mixtures.

Wallaceville

Acorn Poisoning in Cattle

Intensive work at Wallaceville on the effect of acorns on cattle has shown that they can be fatal in comparatively low amounts. A heifer that was presented with only acorns starved itself for three days, ate 15 lb of acorns in two days, and died two days later with severe liver damage. On the other hand a similar heifer ate 4 lb of the same acorns daily for 38 days without showing any effect whatsoever. This latter animal was given as much chaffed meadow hay as it would eat, an average of 12 lb a day. These two examples illustrate a general finding during the work that other food lessens the toxic effect of acorns.

During the experiments carried out so far it has been found possible to produce kidney damage only, liver damage only, or a mixture of the two types. Severe scouring with abdominal pain has been found to be a common feature of the disease. Where experimental animals have died severe dehydration due to scouring and severe liver damage have been the usual features. Animals with marked kidney damage have recovered uneventfully if acorn feeding has been stopped. It seems at this stage that at the first signs of scouring cattle should be removed from paddocks where oak trees are shedding acorns.

Rukuhia

Nutritional Problems of Glasshouse Tomatoes

Trickle irrigation and liquid fertilising are complicating soil analysis for advice on nutritional problems of glasshouse tomato crops. Last season a preliminary examination of the distribution of extractable nutrients and water soluble salts from different positions in relation to the trickle nozzles indicated large differences over distances of only a few inches.

A sampling investigation has been instituted this season, in cooperation with the Vegetable Specialist and Horticultural Advisory Officers, to determine the magnitude of differences according to the sampling position and their possible effect on advice based on soil analysis.

Winchmore

Basin Irrigation

A method of irrigation not commonly practised in New Zealand is being used at Winchmore to investigate the effects of applying excess, sufficient, or less than sufficient water to pasture. In this method the field is divided by levees along both the width and the length, so that each plot consists of an area bounded on all sides by levees.

The treatments are being applied at two levels of moisture deficiency and there are significant differences between these levels. There is no indication yet of differences within the application rates at the same level.

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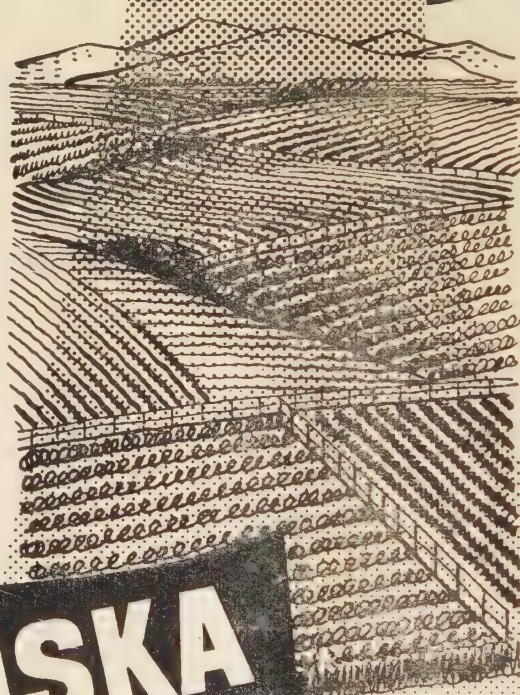
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Duck Farming in New Zealand

Selection of Breeds

By F. C. BOBBY,
Chief Advisory Officer
(Poultry),
Department of Agriculture,
Wellington

DUCK farming, either for egg or table bird production, is not popular in New Zealand, and any person thinking of taking it up for table egg production should think carefully before deciding. There is a market for a limited number of duck eggs, but any appreciable increase in the number of laying ducks invariably results in a saturated market and a tendency for egg prices to weaken. This does not indicate that duck farming cannot be successful, but it does mean that there are limits to duck egg production which are fairly easily reached, particularly when hen eggs are more than adequate for local demand. This article lists the characteristics of various breeds and describes breeding methods, and two later articles in the February and March issues will discuss hatching of eggs, rearing of ducklings, and feeding.

THE duck population in New Zealand, shown below at several census periods, has been comparatively static for the past 30 years, though numbers fell during 1945 to 1956.

Ducks		Ducks	
1921 ..	379,988	1945 ..	319,918
1926 ..	352,030	1951 ..	260,659
1936 ..	377,791	1956 ..	210,718

The fact that there were 4,160,424 fowls in 1956 indicates that ducks do not contribute substantially to egg production in New Zealand.

Distribution of the duck population at the 1956 census was as follows:

North Island	..	..	155,889
South Island	..	..	54,829

Of those in the North Island, 106,521, or nearly half the New Zealand population, were in the Auckland Province, where there are some large commercial flocks.

The limited demand for duck eggs is caused largely by public prejudice against them, particularly during hot weather. Public alarm after an occasional reported illness after eating duck eggs has increased this prejudice. There is, however, no danger in eating duck eggs which have been properly cooked, whether by boiling, frying, or poaching, or when included in any food mixture which is subsequently fully cooked in the ordinary way. Trouble has been very limited and then only when the eggs have been eaten raw or semi-raw as in Spanish cream made with duck eggs.

HEADING PHOTOGRAPH: A duck farm where use is made of a stream.

RECENT TESTS AGAIN CONFIRM VALUE OF COBALT BULLETS

'No deaths'

'Notable
weight gains'

'Greater economy of
treatment'

OFFICIAL NEW ZEALAND TRIAL

Three groups of cobalt deficient lambs about 4 months of age were used in the Test. One group received no treatment, a second group received weekly doses of cobalt and the third group

received cobalt bullets. All lambs were weighed at weekly intervals. This table records the results. Note that 7 lambs died in the untreated group during the duration of trial.

GROUP	NUMBER OF LAMBS	DEATHS	AVERAGE WEIGHT CHANGE	AVERAGE CARCASE WEIGHT
A—Untreated	22	7	— 7 lbs.	24
B—Cobalt dosed	12	nil	+ 23 lbs.	38
C—Cobalt bullet	10	nil	+ 24 lbs.	38

The report shows that cobalt dosing in one form or another, reduces deaths and produces good weight gains. The advantages of 'PERMACO' cobalt bullets over other methods, however, is that they are easily given, with as little trouble as a drench; and once given, supply essential cobalt over a long period with absolute certainty of cobalt intake. Repeated treatments are not necessary, and 90% of sheep respond to the first treat-

ment. The ease, duration and certainty of 'PERMACO' bullets put them out on their own. To quote the report "... if cobalt deficiency is suspected its presence or absence can be confirmed using only a set of scales and about 20 shillings worth of cobalt bullets."

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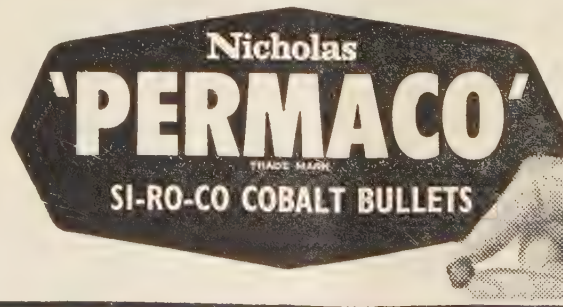
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Duck eggs surplus to shell egg sales are pulped. At one time pastry cooks and bakers appeared to have a prejudice against duck egg pulp. This seems to have disappeared in recent years and the pulp now finds a satisfactory market.

Duck Raising

Ducks, like poultry, are raised either for egg production or for the table. Rearing and management for both purposes are similar in some respects.

Best results with laying ducks are generally obtained where the birds have ample ground, particularly free range, and ducks cannot therefore be generally recommended for small poultry keepers with very limited ground, though ducks raised for the table must be kept on small areas while they are being fattened.

A creek or running water is not essential for laying ducks, and though of some advantage for breeding ducks, is still not essential. Ducks do well running over grass paddocks or in an orchard, but a well drained soil should be selected where possible. Ducks should not be run in confined spaces on heavy soils. Though laying ducks on free range and with access to a creek may pick up some food of value, adequate mash and grain must be fed if high egg production is to be maintained.

The capital outlay for the establishment of a commercial duck farm is appreciably lower than for a poultry farm of equal size.

Choice of Breed

The purpose for which the birds are required, namely for egg production or for the table, will dictate the breed to be selected. Though a dual purpose breed may be selected, generally best results are obtained with a particular purpose breed. Thus for egg production the choice would be either Indian Runner or Khaki Campbell ducks and for the table Pekin or Muscovy ducks.

As with poultry the strain or breeding of the ducks kept for egg production is of great importance. There are good and poor strains of egg-producing ducks and thus the choice of a good laying strain is as important as the choice of a breed.

Breeds

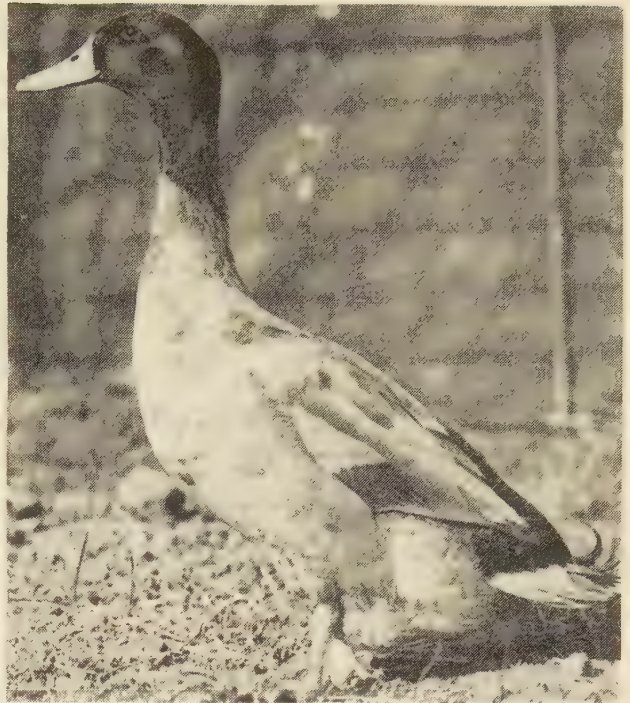
The most common breeds of ducks in New Zealand are Khaki Campbell, Fawn and White Runners, Pekin, and Muscovy.

Khaki Campbell

A most popular egg-producing breed is the Khaki Campbell, and as the quality and flavour of its flesh are good, surplus drakes and culls may be used for the table. It cannot, however, be classified as a table duck. It is referred to at times as a dual purpose duck, but it is more reasonable to classify the breed as being excellent for laying, with drakes which can be disposed of as table birds when not required for stud purposes.

The Khaki Campbell has been developed as a high-producing layer, and flock averages of 200 or more eggs per bird per annum are not uncommon with a good strain and efficient management. Ducks of this breed lay white eggs. The general colour of the duck is khaki, and the drake is bronze or bronze-green in the head, neck, and tail.

DUCK FARMING



[Green and Hahn]

A Khaki Campbell drake. The curled tail feathers and the voice distinguish the drake from the duck.



[Sparrow]

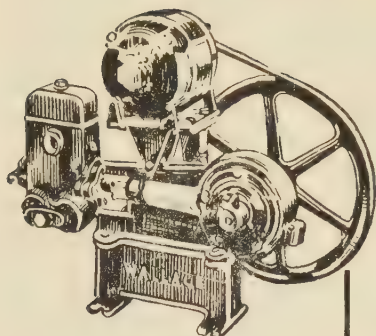
Good-type Khaki Campbell ducks.

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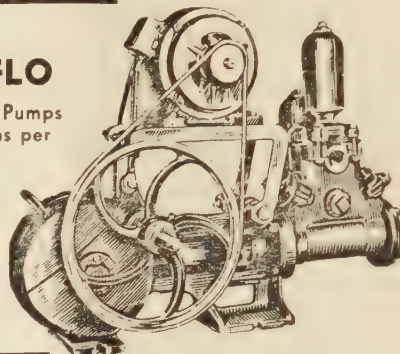
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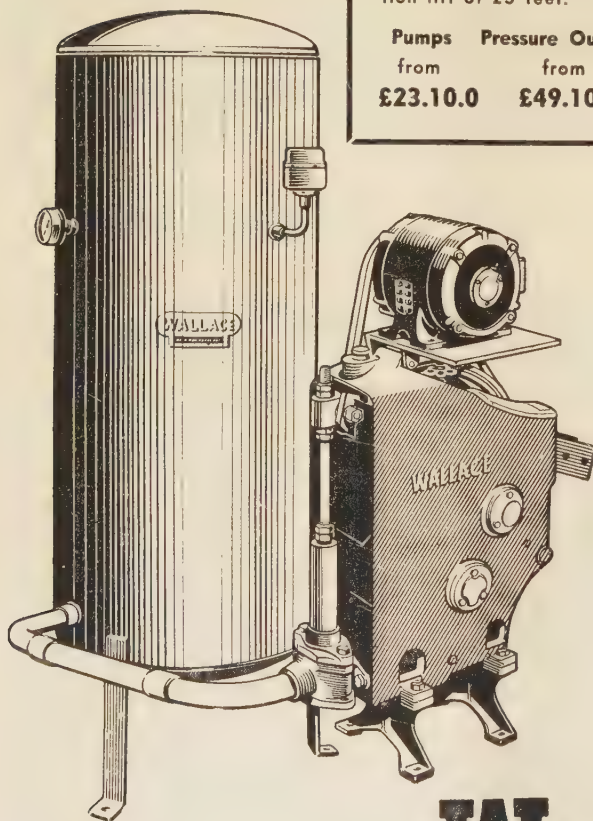
Gearing from	Pressure Outfits from
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Indian Runner

Runner ducks are essentially egg producers, being of a much lighter build than Khaki Campbells. They are not suitable as table birds and accordingly have not the same general utility value. They are excellent layers and until the development of the Khaki Campbell were unrivalled in this respect. There are several varieties of Runner ducks—White, Fawn, and Fawn and White. They are an excellent breed for foraging and benefit from plenty of free range.

Pekin

The Pekin, primarily a table duck, matures quickly and carries a good quantity and quality of breast meat. It will, however, lay well, particularly those strains which have been developed for egg production, but it cannot be compared with the Khaki Campbell in this. The plumage of both sexes is cream and the bill is yellow. Good drakes attain 8 lb or over and ducks a pound less.

Similar in type, colour, and size is the Aylesbury duck, but this bird is white skinned and has a white beak. Early maturing strains are among the best for production of table ducklings killed when about 10 weeks old. Unfortunately this breed is difficult to find in New Zealand at present. The Pekin is most popular as a table duck in the United States and the Aylesbury in the United Kingdom.

Muscovy

The Muscovy may well be termed a dual purpose breed, as the ducks lay moderately well and the drakes are used extensively in this country for the table. Unlike other domesticated ducks Muscovy birds can fly easily. The drake is considerably larger than the duck, the difference being greater than in other breeds of ducks. There are two varieties of this breed, the coloured and the white.

Breeding

Single male matings or mass mating may be used for breeding ducks. The number of ducks for each drake varies with the breed used and the type of mating made. Thus for single drake matings six to eight ducks can be allowed to each Khaki Campbell or Runner drake. With the heavier types of ducks the numbers are lower—five to six ducks for each Pekin drake and four to five ducks to each Muscovy drake. When ducks are mass mated the number of females per drake may be increased by one or two birds above the figures given for single drake matings.

Mass mating is common, but it is claimed that better results (more ducklings hatched per breeding duck) are obtained with single drake matings.

In breeding it is common to mate ducks in their first laying season to drakes of the same year. On the other hand breeding ducks can be kept and

DUCK FARMING IN NEW ZEALAND



[Sparrow

The Pekin duck is primarily a table bird, but will lay well.

used for several seasons, being mated to drakes which are in their first season. Second year birds must be induced to moult in good time to get the breeding stock back into production for when eggs are needed for the incubator. First year laying ducks have a definite advantage in this respect.

Access to water is not necessary for breeding ducks, though some breeders believe that better results are obtained if the ducks have such access. It should be remembered, however, that

cold flowing water in winter or early spring may affect egg production adversely.

When ducks are selected for breeding care should be taken to select birds which are solid and a good weight for the size of their frames. Birds which feel "all feather and frame" should be avoided. Coarseness must also be avoided. Good laying ducks have a refined type of head with bright, wide-awake eyes set toward the top of the skull. The neck should be medium to fine and not coarse. The back of a good duck should be wide



[Sparrow

Muscovy ducks are raised mainly as table birds.

DUCK FARMING

and the front of the bird full. The plumage should be light and silky, denoting health and good condition. Good class ducks and drakes move and carry themselves well with a certain amount of "swagger". In some breeds such as the Khaki Campbell, Runner, and Pekin the drakes may be recognised by their voice and the upward curl of the tail.

It is desirable to mate ducks well before the actual breeding season. Matings should be made in June or July to allow the ducks to settle down before eggs are saved for hatching.

In all but the most temperate climates such as in the northern parts of the North Island it is wise to give breeding ducks some shelter at night. A plain, open fronted, lean-to type of house is adequate. This protection aids in getting breeding ducks into lay for the breeding season where yearling birds are used. Particular

care should be taken to ensure that the breeding ducks are not frightened by cats, dogs, or rats. Ducks are far more nervous than hens and can be easily alarmed. A strange light at night flashed across the run or the front of the duck house is sufficient to cause a temporary panic and an immediate drop in egg production. Apart from a lowering of egg production frights from rats, dogs, etc., are also likely to cause serious drops in fertility in hatching eggs. Exposure to cold winds, especially cold ground draughts, will cause poor fertility. Hurdles, hedges, or similar wind-breaks are useful in duck runs.

It is customary to hatch ducklings during September, October, and November. To get the best results in egg production, ducks should be trapped during their first year of lay so that the best layers may be picked out for breeding. The trapnest boxes are placed at ground level either inside a duck house where the birds shelter at night or out in the runs. The birds go into the nests at night and are

released in the morning when they have laid. Ducks can be taught to use trapnests and to follow routine management practices fairly readily.

Finally, when breeding ducks it is desirable to pick the eggs up as soon after they are laid as possible, more particularly during cold weather.

Heading photograph by Sparrow.

Radio Broadcasts for Farmers

RADIO broadcasts for farmers will be given as follows in February:

IXH Hamilton, 12.33 p.m.

8 February—"Planning the Winter Vegetable Garden", by E. E. Toleman, Horticultural Instructor, Department of Agriculture, Hamilton.

15 February—"Research on the Farm", by P. F. Goulding, Fields Instructor, Department of Agriculture, Hamilton.

22 February—"Footrot in Sheep", by H. R. R. Bouvard, Livestock Instructor, Department of Agriculture, Matamata.

29 February—"Grass Grubs and Army Caterpillars", by J. D. Currie, Farm Advisory Officer, Department of Agriculture, Hamilton.

2XP New Plymouth, 8 p.m.

4 February—"Farm Advisory Division News and Views", by S. H. Henry, Farm Advisory Officer, Department of Agriculture, Stratford.

4 and 11 February—"A Poultry Breeding Plant", by B. J. Russell, Poultry Instructor, Department of Agriculture, Wanganui.

18 and 25 February—"The Radio Vet", by J. H. Macdonald, Veterinarian, Department of Agriculture, New Plymouth.

25 February—"Farm Advisory Division News and Views", by G. R. Moss, Farm Advisory Officer, Department of Agriculture, New Plymouth.

4YA Dunedin and 4YZ Invercargill, 12.36 p.m.

1 February—"Control of Sweet Brier", by R. C. Schofield, Farm Advisory Officer, Department of Agriculture, Alexandra.

8 February—"Land Development Problems", by G. M. Bennett, Farm Advisory Officer, Department of Agriculture, Invercargill.

15 February—"Breeding and Wool Improvement", by W. F. Dick, Sheep and Wool Instructor, Department of Agriculture, Invercargill.

22 February—"Lambs on Feed", by C. A. Martin, Livestock Instructor, Department of Agriculture, Tapanui.

29 February—"Accounting Aids Farm Management", by E. J. Stonyer, Farm Advisory Officer (Economics), Department of Agriculture, Dunedin.

Regular Sessions

1YA Auckland, Mondays at 12.36 p.m. ("Country Journal"), including "Report from Ruakura", Tuesdays, Wednesdays, Thursdays,

and Fridays at 7.45 p.m. ("Country Journal"), Thursdays at 12.33 p.m. ("News for the Farmer").

IXN Whangarei, Mondays at 8 p.m. ("Northland Stock Market Report" followed by "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 12.33 p.m. ("Farm News").

IXH Hamilton, Mondays at 12.36 p.m. ("For the Farmer", excluding first Monday in month and public holidays), Wednesdays at 12.33 p.m. ("Report from Ruakura").

1YZ Rotorua, Wednesdays at 7 p.m. ("Ray of Plenty Journal"), Thursdays, 12.33 p.m. ("News for the Farmer").

2YZ Napier, Tuesdays at 7.10 p.m. ("The Hawke's Bay Farmer") and Thursdays at 12.33 p.m. ("News for the Farmer").

2XG Gisborne, Tuesdays at 8 p.m. ("Farm Session").

2XP New Plymouth, Thursdays at 8 p.m. ("Farm Session").

2XA Wanganui, Mondays at 8 p.m. ("For the Man on the Land"), Tuesdays at 8 p.m. ("Farm Supplement"), and Thursdays at 8 p.m. ("Farm Topics").

2XB Masterton, Fridays at 6.45 p.m. ("Farm Session").

2XN Nelson, Thursdays at 8 p.m. ("Nelson Farm Topics").

2ZA Palmerston North, Mondays at 12.36 p.m. ("Country Digest") and Fridays at 8.30 p.m. ("Country Digest", including Feilding stock market report).

2YA Wellington, Mondays, Tuesdays, and Fridays at 7.10 p.m. ("Farm Session"), Thursdays at 12.33 p.m. ("News for the Farmer").

3YA Christchurch, Mondays at 12.20 p.m. ("Country Session"), Thursdays at 12.33 p.m. ("News for the Farmer"), and 7.10 p.m. ("Home Paddock").

3XC Timaru, Wednesdays at 8 p.m. ("Farmers' Weekly News Service") and Saturdays at 10.30 a.m. ("Country Mailbag").

3YZ Greymouth, Mondays at 12.36 p.m., Thursdays at 12.33 p.m. ("News for the Farmer").

4YA Dunedin, Mondays at 12.36 p.m., Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.36 p.m., Wednesdays at 12.33 p.m., and Thursdays at 12.33 p.m. ("News for the Farmer").

Pathologist Discusses White Muscle Disease in United States



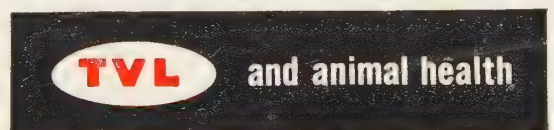
MR W. J. HARTLEY, Pathologist at the Department of Agriculture's Wallaceville Animal Research Station, who attended the inaugural meeting of the Compared Neuropathology Commission in Berne, Switzerland, at the end of November. On his way to Switzerland Mr Hartley spent about two weeks in the United States studying white muscle disease of lambs and the use of selenium to control it.

White muscle disease is a problem round Taupo and Rotorua and in parts of the South Island. Department of Agriculture experiments with selenium have been very promising, but much more information is needed on this highly poisonous mineral. Much work has been done in the United States on white muscle disease and the use of selenium to combat it and Mr Hartley discussed it with research workers in institutions at Davis, Corvallis, Bozeman, and Washington.

The meeting Mr Hartley attended in Berne was under the auspices of the World Federation of Neurology, which paid all expenses of delegates.



Calfhood vaccination prevents contagious abortion All heifer calves *need protection* against contagious abortion the Department of Agriculture recommends that every heifer calf should be vaccinated. Consult your veterinarian or livestock instructor as early as possible.



Nassella Tussock in Argentina

By H. E. CONNOR,

Botany Division, Department of Scientific and Industrial Research, Christchurch

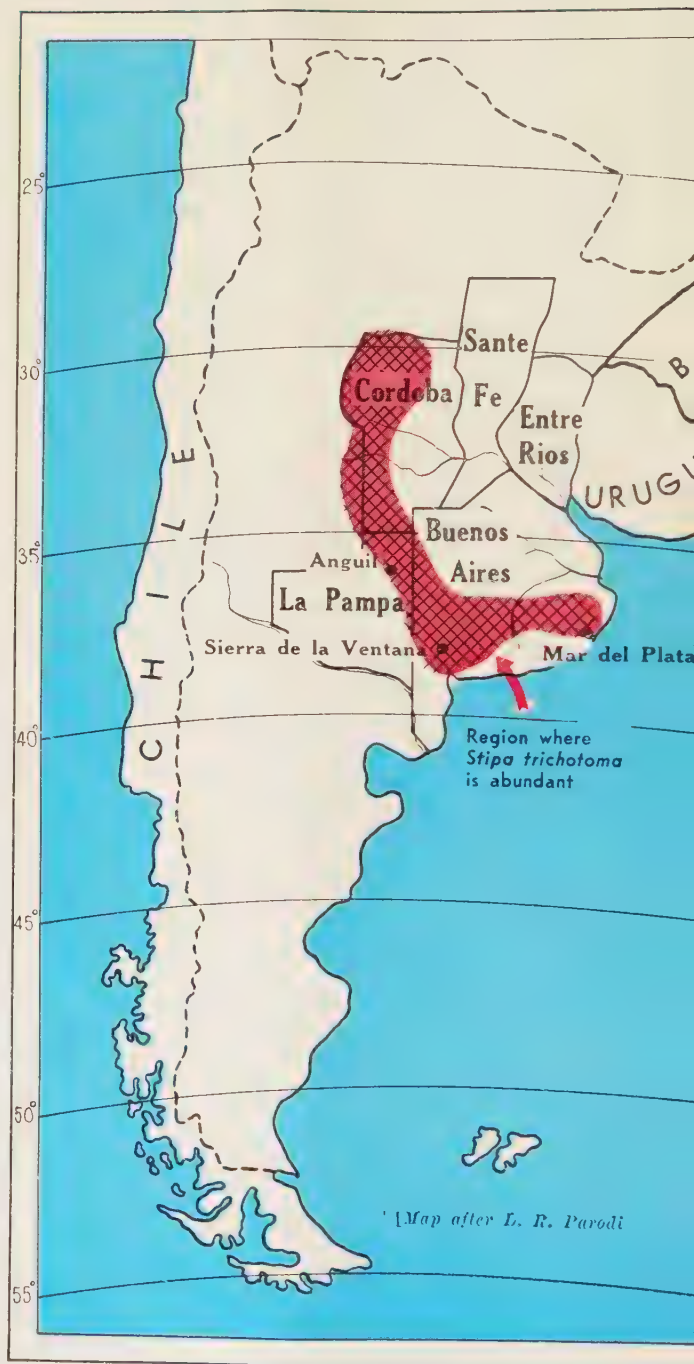
THE problem of *nassella* tussock in North Canterbury and Marlborough needs no restating in this "Journal". Numerous articles on its recognition, its extent in the South Island, and methods of control have been published both in the "Journal" and elsewhere. This South American plant has been recognised as a serious pastoral and agricultural weed in New Zealand for nearly 20 years, and strenuous and expensive effort has gone into its control. *Nassella* tussock is a problem, too, in New South Wales and Tasmania, and it has recently been reported from Italy. In August and September of 1958 on behalf of the North Canterbury *Nassella* Tussock Board I had the opportunity of observing in detail *nassella* tussock in some areas of its densest natural distribution in the Republic of Argentina. My trip took me across the very flat plain (the pampas) of the Province of Buenos Aires and part of the Province of La Pampa into the mountainous areas of Sierra de la Ventana in the south-western part of the Province of Buenos Aires, two very contrasting environments.

IN Argentina there are several species of *Stipa* very similar to *nassella* tussock (the correct botanical name of which is *Stipa trichotoma*) and the differences among these species were being studied at the Experimental Station, Anguil. Difficulties in the recognition of *nassella* tussock in Argentina were discussed during a visit to the Station.

The following comments and observations are restricted solely to those parts of Argentina visited and it would be dangerous to apply them directly to the situations existing in North Canterbury and Marlborough.



Grazing preferences: In the foreground grazed *nassella* tussock with taller grazed *Stipa brachychaeta* around it. Ungrazed *Melica* in the background, Sierra de la Ventana, Province of Buenos Aires.



Nassella tussock, commonly called *paja voladora* (flying straw) or *flechilla* (a small arrow), occurs in Argentina most abundantly in an area from Mar del Plata west to the eastern part of the Province of La Pampa, then northward to the mountains of Córdoba. Specimens of *nassella* have been collected from other areas including the Provinces of Santa Fe and Entre Rios, but in these

areas it is not abundant. *Nassella* is abundant in Argentina from latitude 30 degrees south to latitude 39 degrees south, whereas in New Zealand the zone is approximately between 41 and 44 degrees.

The climate in Argentina is continental by contrast with the oceanic climate of New Zealand. The annual rainfall on the plains at Anguil is 24 in. and for the mountainous area of Sierra de la Ventana 31 in. These figures do not differ greatly from the figures for two *nassella* areas in New Zealand, Blenheim 24 in. and Balmoral Forest 25 in. The total rainfall in three of these localities is about the same, but the distribution throughout the year is quite different. At Anguil from May to September the rainfall is 4½ in. while at Balmoral and Blenheim it is 11 to 12 in.

In New Zealand *nassella* tussock is most abundant on dry north-west aspects on the hills and on dry sites on the flats. In some places *nassella* is found on shady aspects and it is thought that there is a tendency for its occurrence on these to be increasing. In Argentina, however, *nassella* can be found on dry northerly or shady southerly aspects on the hills, in damp sites either on the hills or the plains, and in dry sites on the plains. The only sites where *nassella* was not found were the salty ones round lagoons.

That *nassella* frequently occupies the poorer soils in areas where the topography is broken was clear. In the mountainous area at Sierra de la Ventana on the bottom valley lands, where moisture is more readily available, *Stipa brachychaeta* is dominant and there is little if any *nassella*.

On the loessal (deposited) soils of the pampas, where the landscape is unbroken, topography has a small effect on species composition, which is determined by interplant competition,

NASSELLA TUSSOCK IN ARGENTINA



Grazing preferences: Ing. C. A. Petetin marking the size of grazed *nassella* tussock in relation to the ungrazed *Melica* to either side. A stand of ungrazed *Stipa* in background. Sierra de la Ventana, Province of Buenos Aires.

grazing pressures, and the availability of edible plants.

Grazing of *Nassella* Tussock

The most striking feature about *nassella* in the areas visited in Argentina was that the tussocks were heavily grazed. There were not isolated examples of this; in all places where *nassella* was found it was heavily grazed, and grazed in preference to other species of *Stipa* present, with the exception of *Stipa tenuis*. Other grasses (species of *Melica* and *Paspalum*) were not grazed at all in some areas.

Nassella tussock, which is included in the "hard grasses", can be particu-

larly useful in autumn, winter, and spring, when it is grazed by cattle, sheep, and horses. At this time there is grazing available from other perennial species of *Stipa*, some of which are much less attractive than *nassella* tussock (for example, *S. brachychaeta*, *S. dusenii*, *S. tenuissima*, *S. gynerioides*, and *S. hyalina*). Yet I did see examples of *S. brachychaeta* grazed very heavily, and a close but unnamed relative is regularly grazed. The frost-susceptible *Cynodon hirsutus* makes no contribution to grazing until November and then is one of the more important species, while the annuals *Erodium cicutarium*, *Medicago minima*, and *Hordeum leporinum* begin growth in early September.

Against this background of seasonal availability, the grazing of *nassella* tussock is perhaps more readily understood. I did not see many plants that had not been grazed, even on the rockiest places among the foothills of Sierra de la Ventana. *Nassella* here, as on the pampas, was always bright green, having the appearance we associate with newly burnt or vigorously growing *nassella*. The grazing of *nassella* tussock in Argentina is reminiscent of the cattle grazing trials conducted by the Marlborough *Nassella* Tussock Board at "Wrekin" and the Department of Lands and Survey at "Glenbourne" in North Canterbury, where, when all the better forage was eaten, the cattle grazed *nassella*.

Single plants of *nassella* tussock of the size common in New Zealand were not seen, nor was there the dense stand familiar in North Canterbury. At Sierra de la Ventana, where 60 years ago *nassella* was described



Nassella tussock grazed by cattle in mountainous area at Sierra de la Ventana, Province of Buenos Aires.

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as the most abundant grass in the fields of the valley, it has not assumed the complete dominance which would be expected from experience in New Zealand.

In the Anguil area, nassella was often the only perennial grass species left in the association. The strong-rooting habit of the species may to some extent assist its permanence. Another indication of the extent to which nassella is grazed was the difficulty in finding seed heads.

Grazing of tussocks through into November would greatly reduce the amount of seeding. After three days' searching two panicles were found lodged in rocks, but no seed heads were found in the more obvious places (gullies, creeks, or caught in the bases of taller plants). Yet in this area it is recorded that seed heads were common in creeks and gullies 60 years ago.

It has been recognised in New Zealand that nassella tussock does not invade tight swards or grasslands in good condition; nor does it thrive when overcrowded by taller vegetation or smothered by plantations of trees. My observations in Argentina fully support these New Zealand conclusions.

With rare exceptions nassella tussocks did not enter stands of tall-growing *Paspalum quadrifarium* or

Grazed nassella tussock in a paddock at Anguil, Province of La Pampa. Ing. G. Covas, Director of the Experimental Station, Anguil, marks the height of the tussock. The distribution in the paddock can be clearly seen.



Stipa brachychaeta, and in a plantation of trees about 50 years old there were a few nassella plants on the margins and where the canopy had broken and additional light entered. With the system of annual cultivation practised in parts of Argentina nassella does not occur in the fields, but the more undesirable *Stipa brachychaeta* does.

In Argentina nassella tussock is not a weed; it may be disappearing from the climax grasslands under the pressure of grazing and cultivation.

A serious weed problem rapidly developed in New Zealand when nassella tussock entered a new environment where conditions such as species composition of pastures, palatable species, less marked seasonal

differences in available grazing, grazing pressures, and stocking rates differed from those in its country of origin. But this is the common story of weeds and it is often remarkable that in the chance arrival of plants, even worse ones have not reached New Zealand.

These notes, while attempting to place in better perspective comparisons between two countries, should not obscure the grave problem that nassella represents in North Canterbury and Marlborough.

Acknowledgments

Appreciation is expressed for assistance in Argentina by the Director and Ing. Carlos A. Petetin of the Instituto de Botanica, and by Ings. L. Parodi, G. Covas, C. D. Itria, and O. Boelcke.

Chemical Methods of Drain Cleaning

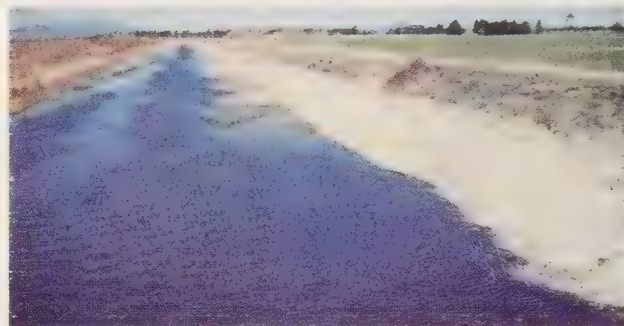


USE of soil sterilants, such as monuron, for drains is limited to those which dry out during summer. As the larger communal drains, such as those usually controlled by drainage boards, may not dry out at any time of the year, soil sterilisation may not be possible. However, growth above water level can be dealt with very effectively with dalapon, amitrol, and 2,4-D as the illustrations above of a drain before and after spraying show.

For most conditions a mixture of dalapon and amitrol is very satisfactory, but where watercress, buttercup,

rushes, or convolvulus is present 2,4-D should be included. The application of 10 lb of dalapon, 5 lb of amitrol, and the ethyl ester of 2,4-D at 2 lb of acid equivalent per acre appears to control all weeds including the most resistant grasses such as reed sweetgrass (*Glyceria maxima*), paspalum, and tall fescue: where such grasses are absent the rates of dalapon and amitrol can be reduced by at least a half.

Experience has indicated that initial sprayings should be carried out in spring, August being best. A follow-up spraying in early autumn ensures a



clear waterway for winter. The cost of two annual sprayings is considerably less than one mechanical cleaning.

Weeds controlled by spring applications have included floating sweetgrass (*Glyceria fluitans*), raupo, and purua grass (*Scirpus maritimus*). Only autumn sprayings (from February onward) are effective against reed sweetgrass and tall fescue.

—G. L. BANFIELD.

Farm Advisory Officer,
Department of Agriculture,
Thames



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WEED IDENTIFICATION AND CONTROL

By L. J. MATTHEWS,
Senior Scientific Officer,
Department of Agriculture,
Wellington

This is one of a series of articles illustrated in colour to appear in the "Journal" from time to time in which identification and control of various weeds will be discussed



BUTTERCUPS (*Ranunculus* spp.) according to species are fairly widely distributed throughout New Zealand in wet places, in waste areas, and in pastures. The main reason they are regarded as weeds is that at least three species are poisonous to stock and at least two species can compete with, and become, if unchecked, serious weeds of, high-producing dairy pastures.



Most of the buttercups are readily killed by hormone sprays. However, correct timing of applications is important both for good results and to avoid clover damage.

THE three recognised poisonous species are:

R. flammula: Limited in its distribution to as far south as Timaru

R. rivularis: Abundant in damp places and swamps

R. sceleratus: Abundant in waste places

The last named is regarded as the most poisonous, though fewer deaths of stock are attributed to this species than to *R. rivularis*.

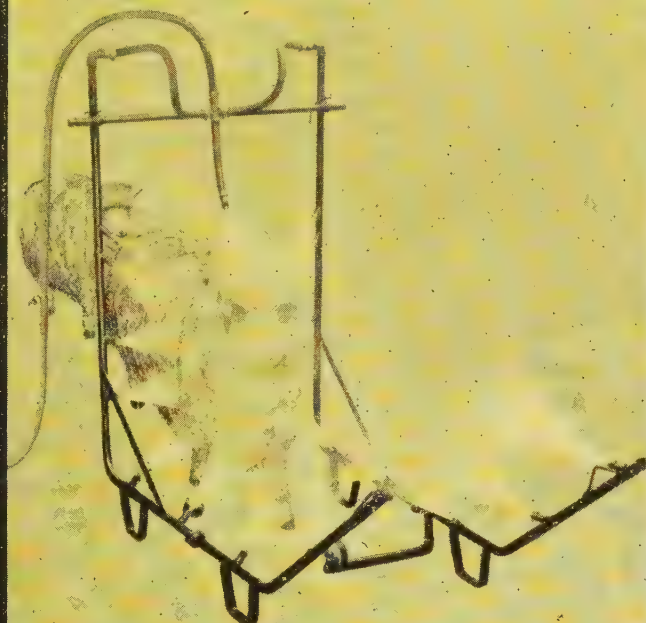
R. acris (giant buttercup) and *R. repens*, perennials, are plentiful throughout New Zealand and both compete with high-producing dairy pastures. Both species were undoubtedly spreading in New Zealand as the production of dairy farms was increased until the advent of selective weedkillers. These have since been the main weapon for arresting the spread of the species.

Identification and Control

The identification of buttercup species is important in the use of the correct hormone material and in recognition of species that are poisonous. A means of identifying the more common buttercups suggested by A. J. Healy, Botany Division, Department of Scientific and Industrial Research, Christchurch, is given on page 25.

Neither *R. acris* nor *R. repens* is controlled by normal farm practices aimed at increasing production on

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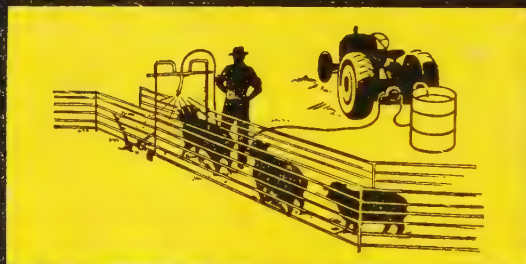
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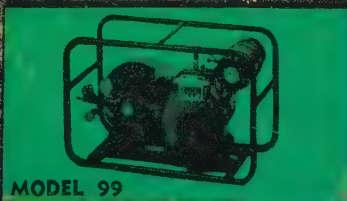
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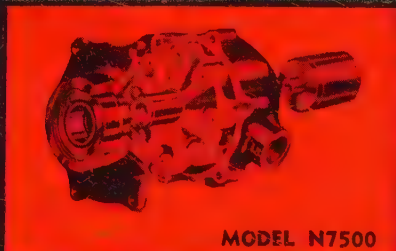


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Identification of Some Common Buttercups

THE identification of the common, economically significant buttercups (*Ranunculus* spp.) can be made with reasonable accuracy in the field on the basis of:

1. Shape of basal or rosette leaves.
2. Presence or absence of hairs.
3. Growth habit.

The characteristic shape of the basal, ground, or rosette leaves (the stem leaves are often markedly different) of the different species is shown in the diagram, and other characters which will facilitate identification are provided in the following key to the species:

- [1] Leaves hairy (proceed to) 2
Leaves lacking hairs, often shining (proceed to) 6

- [2] Leaf margins toothed or entire (proceed to) 3
Leaf margins deeply cut, with distinct segments (proceed to) 4

- [3] Leaves densely soft hairy, distinctly toothed (F) *R. parviflorus*
Leaves with few hairs, closely pressed to surface, faintly toothed or entire (G, H) *R. flammula*

- [4] Leaves deeply cut to fine segments, stalks of all segments of about same length (A) *R. acris*
Leaves with middle segment with stalk distinctly longer than those of side segments (proceed to) 5

- [5] Leaves dark green; plant with above-ground, rooting runners (strawberry-like) (B, C, D) *R. repens*
Leaves light green; plant erect, lacking above-ground runners (I) *R. sardous*

- [6] Leaves entire or shallowly toothed only (G, H) *R. flammula*
Leaves more deeply cut (proceed to) 7

- [7] Leaves small, cut to fine segments; plant creeping, often forming mats or patches (J) *R. rivularis*

- Leaves larger, less finely cut, celery like; plant erect, not creeping, stem hollow (E) *R. sceleratus*



dairy farms, though sheep when mob stocked control either.

Most of the buttercups are readily killed by hormone sprays. Preparations of MCPA are more toxic generally than 2,4-D preparations, particularly to perennial species such as *R. repens*. MCPA and 2,4-D should be used wherever possible before spring growth of clover begins and when the buttercup plants are still small. Used at that stage they will not cause clover damage. Rates of application of MCPA and 2,4-D can range from as low as $\frac{1}{4}$ lb to $\frac{1}{2}$ lb of acid equivalent per acre.

If the application has to be made after clover has begun to grow, MCPB should be used at 1 lb of acid equivalent per acre.

Preparations of 2,4-D give poor control of *R. acris*, for which MCPA or MCPB should be used.

In farm practice it has been found necessary to apply MCPA early at 1 lb of acid equivalent per acre before clover starts growing and to make a second application later in spring or in early summer. The first application controls seedlings and small plants; the second is usually made when the plants are approaching flower head formation. To avoid

clover damage MCPB should be used at rates of 1 to 2 lb acid equivalent per acre for this later period of application. As both *R. acris* and *R. repens* cannot be controlled by farm-management practices in a wet season, these species may have to be sprayed annually for several years.

Caution

Buttercups should not be grazed for at least 2 weeks after being sprayed. Spraying makes buttercups more edible to stock and this increases the danger of their being grazed and consequently of poisoning from the poisonous species.

Care of Livestock during February

By the Animal Research Division

IF ewes have been held on short pasture since weaning, they should now be in good, hard condition. About 21 days before tupping they should be crutched and given the best pasture available. Experiments at Ruakura have shown that flushing ewes for three weeks before tupping and keeping them on good pasture for three weeks after tupping begins increases the number of lambs marked by 20 per cent. Rams, too, should be crutched and flushed for about three weeks before tupping. They should be dipped before this flushing period, as dipping too close to tupping appears to reduce ram fertility.

Bush sickness can be completely prevented by topdressing annually with cobaltised superphosphate, and in the North Island at least this is best applied in the annual autumn topdressing. Cobaltised superphosphate prepared in North Island

COBALT DEFICIENCY works contains 3 lb of cobalt sulphate per ton. Two cwt of this fertiliser contains sufficient cobalt for 1 acre. In the South Island cobaltised superphosphate contains 6 lb of cobalt sulphate per ton, and 1 cwt of this contains sufficient cobalt for 1 acre. If greater quantities of fertiliser than those indicated above are used, the additional amount need not be cobaltised. For fuller details consult the Department's Bulletin No. 180, "Cobalt Deficiency in Sheep and Cattle".

Scouring in cattle and staggering in lambs grazing on peat and other copper-deficient land can be prevented by topdressing the pastures in autumn with 5 lb of bluestone per acre. Copperised superphosphate is now available, or the bluestone may be mixed with lime. For fuller particulars the Department's Bulletin No. 238,

COPPER DEFICIENCY "Copper Deficiency in Cattle and Sheep" should be consulted. Where topdressing is not practical injections of copper cerate can be used.

If warm rains fall in late summer or autumn, after a spell of hot weather, facial eczema is likely to occur in districts which are usually affected. Experience during recent years has conclusively shown

FACIAL ECZEMA that the disease can be prevented by shutting sheep up at a rate which leaves no pasture in the paddock after 24 hours. Sheep should be shut up as soon as rains fall and should be confined until the weather becomes either hot or dry or much cooler and the pasture visibly hardens. If the summer is hot, plans should be made for action along these lines. Good hay at 2 lb per sheep per day will prevent loss of condition. Even if adequate hay is not available, when ample water is provided ewes are not harmed by one or two weeks' starvation. It is better to take precautions too often than to run the risk of a disastrous outbreak of facial eczema.

If crops of rape, kale, turnips, or chou moellier are available, they can safely be grazed during the dangerous period. The grazing of such crops is the only satisfactory way of preventing the disease in lambs, which react badly to restricted grazing. Lucerne has not proved safe, possibly because of ryegrass which is frequently present as a weed; but in east coast districts paddocks of pure white clover are safe and lambs do well on them.

Preparations should now be made for the autumn hatch by blood-testing the flock for pullorum disease and by cleaning and fumigating the incubators. A vacuum cleaner is ideal for cleaning, and advice on fumigation may be

obtained from the local Poultry Instructor of the Department of Agriculture.

Autumn is a critical period for calves. Deaths during winter can be eliminated by rotating dairy calves through the paddocks ahead of the cows at intervals of three or four days. If this is not being done, it

CARE OF CALVES should be begun immediately. Calves so treated will be up to 100 lb heavier as yearlings than those confined in a calf paddock. Early weaned beef calves on hill country should be given the pick of pastures ahead of other stock. If calves are unthrifty and scouring, it may be necessary to give two or three doses of phenothiazine at three-weekly intervals, but this is seldom necessary with calves which are rotationally grazed.

Infertility may be due to several infectious diseases which are known to be present in New Zealand. Reliable tests for these are now available. If more than the usual number of cows are still empty, veterinary assistance should be sought promptly.

Sows with litters should be fed at the rate of 4 gallons of milk plus 2/3 gallon per pig suckled. Sows and litters should be allowed at least two hours' grazing per day.

SOWS AND WEANERS It is an advantage to provide water sprays for both suckling and dry sows during summer because pigs possess very few sweat glands and can be kept cool only by the evaporation of water from the skin. Litters over three weeks of age must have milk and meal available at all times. Observations at Ruakura have shown that piglets suckle at intervals of 75-90 minutes throughout the 24 hours, and after the sixth week visit the creep after each suckling. Good creep management can add 6 to 10 lb per pig to the weaning weight.

Weaned sows must be well fed to ensure successful mating. A ration of 4 to 6 gallons of milk daily plus grass is essential.

Weaned pigs should be fed 1½ to 2 gallons of milk daily. If the milk available is not sufficient to provide this, the feeding of meal to supplement the milk ration, 1 gallon of milk being replaced with 1 lb of meal, is profitable at present meal and meat prices.

Vitamin A is essential to poultry for protection against various infections, particularly colds and contagious catarrh. Poor egg production is a common feature of an inadequate supply of vitamin A to laying birds.

VITAMIN A FOR GROWING AND LAYING BIRDS Green feed is a useful source, but at certain periods of the year when this becomes scarce or poor in quality it may be of little value. When good quality green feed is not available, the addition of one of the several vitamin A-rich productions on the market such as synthetic vitamin concentrate powder, emulsion, or fish oil is advisable for laying pullets. The amounts used vary according to the product selected and the age of the birds to be fed. The quantity advised by the manufacturer of the product should always be used when adding a vitamin supplement to the diet.

Further advice on the use of vitamin A supplements may be obtained from the local Poultry Instructor of the Department of Agriculture, and a special leaflet on the subject is available.

Pasture and Crop Management

Seasonal Notes by the Farm Advisory Division

SEEDS MIXTURES FOR SHEEP FARMS

A COMBINATION of perennial ryegrass and white clover forms the basis of pastures for sheep grazing. The following mixture is best suited to well managed sheep pastures on moist fertile soils, but provided the fertility is kept up by top-dressing it will do well over a very wide range of conditions.

	lb per acre
Certified perennial ryegrass	15-20
Certified short-rotation ryegrass	5-8
Certified cocksfoot	3-4
Crested dogtail	1
Certified white clover	3
Certified Montgomery red clover	2
Certified cowgrass	1
Total	30-39

Only 5 to 8 lb of short-rotation ryegrass is sown, as this grass is not nearly as well suited to sheep grazing as it is to the more lenient cattle grazing, and an open and weedy sward results if too much short-rotation ryegrass is sown and too little perennial ryegrass. Cocksfoot behaves as a true perennial even under very hard grazing, though it alters its habit from a tall, tufty grass to a small-leaved prostrate one. Timothy is not included, as it is so palatable that sheep seek it out, and the combination of preferential grazing and vigorous competition from the perennial ryegrass means that it soon disappears from the sward.

For harder conditions where the soils dry out badly in summer, the following mixture is recommended.

	lb per acre
Certified perennial ryegrass	15-20
Certified cocksfoot	4-6
Crested dogtail	2
Certified white clover	2-3
Certified Montgomery red clover	2
Certified Mount Barker subterranean clover	1½
Certified Tallarook subterranean clover	1½
Total	28-36

Unless trial work has definitely established that one or other of the two strains of subterranean clover is superior in the district, a mixture of both should be sown. Every effort should be made, by adequate fertilising and lax summer grazing to keep the white clover vigorous in the sward, as the fertility of the pasture will deteriorate if the subterranean clover becomes the only clover. There is little to be gained by sowing short-rotation ryegrass in these conditions, as the combination of close grazing by sheep and a dry summer usually kills much of it.

—D. I. GLUE, Wellington

SOD SEEDING

SOD seeding is an ideal method of renovating pastures without the need for cultivation. Six to 10 lb of grass and clover seed can be sown with 1 cwt of serpentine or reverted superphosphate directly into the existing sward. This enables the introduction of better pasture species and thickens weak swards, thereby reducing weed infestations and bare ground.

Sod seeding is a cheap once-over operation, which uses less seed, time, and machinery than conventional methods. The area that can be sod seeded is limited by the stock available to graze the existing sward closely before seeding

and to control it after the drilled grass has established. With sod seeding the consolidation and fertility build-up in the topsoil layer of an old pasture are not disturbed. Timing of overdrilling is very important to ensure enough moisture for germination.

Good management is essential for successful results. Where a paddock is low in production the reason should be found and corrected. Low fertility should be corrected by better topdressing, wet conditions by better drainage, and insect pests should be destroyed.

After sod seeding, the pasture should be treated as a newly sown paddock to give the grasses a chance to establish. Stock should be brought in to graze the area leniently and take off the top growth. They should not be allowed to camp on the area.

—J. L. DOUTRE, Auckland

UTILISATION OF THE TURNIP CROP

IN spite of the increasing use of silage as a supplement for feeding to dairy cows during a dry summer and autumn, many dairy farmers still grow a crop of soft turnips for feeding off over this period. Though cows will produce reasonably well on a diet consisting almost entirely of turnips, they will lose condition in the process. This loss of condition can be arrested by running the cows off the turnips on to any good grass that may be available, by feeding out good silage, or by the use of a crop of green feed maize to be fed off in conjunction with the turnips.

Cows should never be permitted to range freely over the turnip crop, which should be fed off in breaks with the electric fence. Two hours daily should be allowed on the crop, after which the herd should be turned out on to a grass paddock.

If the area of crop is small, it may pay to pull the turnips and cart them out to the stock. Though this method of feeding out is laborious and slow, it will permit better utilisation than is obtained if the area is grazed off. To avoid turnip taint in milk or cream, do not permit cows access to turnips within at least four hours of milking.

If the weather is wet and humid, the bulbs may be affected by bacterial soft rot, becoming soft and rotten. Under such circumstances the crop should be fed off as soon as possible.

—A. V. ALLO, Tauranga

CRICKET CONTROL

CRICKETS can be killed with baits made of DDT, lindane, or dieldrin or by dusts of dieldrin.

The standard cricket bait consists of 24 lb of bran, 4 lb of molasses, and 1/10 lb of DDT. The molasses and DDT are dissolved in about 2½ gallons of hot water and the bran is added to bring the mixture to the consistency of a mash. This material may be broadcast by hand, like grass seed, or it may be spread by topdresser, but the mash needs to be somewhat drier for even distribution through the machine. Dieldrin and lindane are equally effective in baits.

Dieldrin applied as a dust in dieldrin superphosphate at 2 cwt to the acre kills crickets quickly and effectively. In this form 6 oz of dieldrin is used to the acre. Dusting with DDT is not effective.

If insecticides are applied too early, in December and January, a second crop of crickets may infest the area. Treatments put on in early February have been most satisfactory. Treatment should not be delayed until pasture damage is severe, because damaged pastures take a long time to recover.

—G. B. HADDOW, Auckland

Reducing Incidence of Bitter Pit in Apples

By T. CONWAY,

Instructor in Horticulture, Department of Agriculture, Hastings

THOUGH means of preventing bitter pit in apples have not yet been discovered, it is possible to restrict the incidence by attention to certain aspects of fertilising, pruning, and harvesting, which are discussed below. Growers are urged to adopt the precautions recommended to protect their markets, both local and overseas, for the important varieties which are prone to this defect.

BITTER pit is normally most serious in Cox's Orange, Bledisloe Cox, Kidds Orange Red, and Golden Delicious, though it is worst in Cox's types. Cultural aspects to which attention should be given are:

Care with Fertilisers

Unwise or excessive use of nitrogen fertilisers has always been thought to be a contributing factor in inducing bitter pit, though some Nelson trials tended to discount this. However, until investigations have been extended some caution is necessary; in fact, provided Cox's type trees are growing well, it may be wise not to use nitrogen (including fowl or sheep manure) on them. If it is used, it should certainly be applied in moderation. Particular care with nitrogen is required in seasons when the crop is light to avoid unduly increasing fruit size.

Pruning According to Vigour

Pruning should be related directly to the vigour of the trees, the object being to induce only moderate growth. Strong-growing trees, including those on strong rootstocks, should be lightly pruned. Thinning out of surplus lateral growth is preferable to shortening such growth. Lateral fruiting should be encouraged, as this tends to ensure the fruit being of more uniform size and helps to regulate cropping.

Encouraging Regular Cropping

It is the marked biennial bearing habit of some varieties, such as the Cox's, which is responsible for the light crops so prone to bitter pit. Therefore whatever can be done to ensure regular cropping will assist in the avoidance of bitter pit. Chemical thinning may yet prove of considerable benefit, as this tends to promote regular cropping.

Where irrigation of apple crops is necessary only sufficient water to maintain a steady development of the crop should be applied. Late, heavy irrigation toward the time of harvesting should definitely be avoided.

During light-crop seasons it will probably be best not to thin the fruits, so that they are kept to a reasonable size. However, in heavy-crop seasons some thinning of Cox's will be necessary, but there seems to have been a tendency to overdo thinning. A moderate thinning will not only ensure fruit of a fairly even size and therefore less likely to be affected by bitter pit, but will provide a higher proportion of the best export sizes.

With improved orchard practices and spray materials fruit trees generally are today in better heart and capable

of carrying more fruit than formerly to a satisfactory average size. At the same time overseas reports show that too much fruit is larger than is preferred. More moderate thinning than has been commonly done seems desirable.

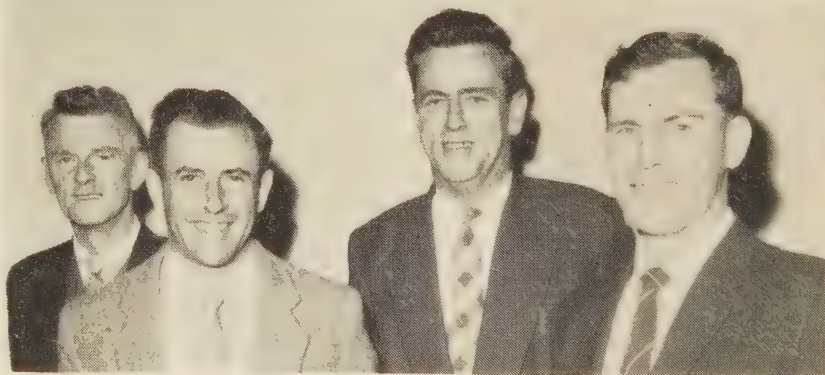
Later Harvesting

The incidence of bitter pit in Cox's Orange has always been greatest among the earliest picked lines. It is recommended therefore that harvesting should be begun 8 to 10 days later than has been usual and harvesting and packing completed over a relatively short period.

Fruit from Young Trees

Fruit from young trees of susceptible varieties will almost certainly develop bitter pit quite severely. For that reason such fruit should be packed separately for the local market and the note accompanying it should be endorsed "Fruit from young trees". It will then be marketed promptly and consumed before its condition deteriorates.

New Appointments in Horticulture Division



AS part of the move to broaden its district experimental and advisory services in horticulture, the Department of Agriculture has created four new senior positions in its Horticulture Division. The new positions are for Assistant Horticultural Superintendents at Nelson, Dunedin, Hastings, and Hamilton.

The officers appointed to the new posts and who are shown left to right above are: Hamilton, **A. T. J. Watts**, formerly Horticultural Advisory Officer (Stone Fruit), Christchurch; Hastings, **B. N. W. Congdon**, formerly

Horticultural Advisory Officer, Hastings; Nelson, **M. G. Baumgart**, formerly Horticultural Advisory Officer (Storage), Wellington; and Dunedin, **I. G. McK. Forbes**, formerly Horticultural Advisory Officer (Vegetables), Wellington.

Until now the district work of the Division has been administered by the Horticultural Superintendents in the district offices at Auckland, Palmerston North, Nelson, and Christchurch. The new appointments will enable closer supervision and guidance of district experiment and advisory work.

Swedish Landrace Pigs

Recent Importations Offer Interesting Possibilities with New Breed in N.Z.

THE first importation of Swedish Landrace pigs to this country came from Australia in April 1959. This was a young boar for the Weeley Stud of Mr A. T. deGroot, Te Kowhai. Other importations from Australia were followed in November by the arrival of four pigs from Northern Ireland for Mr Bryce Williams of Hawera. These pigs are the first to be imported from that area for four years and, with the relaxation of restrictions due to atrophic rhinitis on imports from the United Kingdom, may lead to profitable developments in our pig industry.

THE Landrace breed is probably best known as being the basis of the Danish pig industry. By careful attention to type and weight of pig and progressive methods of breeding and selection, the Danes have developed a very uniform product to capture the English Wiltshire bacon market. They are most anxious to hold this export market of about 200,000 tons of pig meat and will not now allow any Landrace stock to go out of Denmark.

Sweden has adopted similar methods of developing the Landrace and some Danish bred stock were used to introduce good strains. Approval to import Swedish Landrace pigs into Britain was given in 1949 and they are now so popular there that they are second only to the Large White breed numerically.

The Landrace has been specially bred to give a carcass with the maximum yield of bacon with the minimum of wastage. It has ideally a small head and neck, light shoulders, great length of side, and heavy hams, with plenty of lean meat, a small proportion of fat, and fine bone.

By E. D. EDWARDS,
Research Officer,
Department of Agriculture,
Wellington

These superior carcass qualities are associated with a capacity for rapid growth and efficient use of food and the sows have proved to be good foragers and excellent mothers. While essentially it is a bacon breed, its success as a porker was demonstrated at 1956 Smithfield competitions. Landrace boars mated to British bred sows have also produced first-class cross-bred pigs.

The Landrace will probably prove superior to New Zealand breeds in carcass quality, but if this is to be maintained a sound breeding policy must be followed. The breed has been developed to its present high standard after many years of careful selection based on sow recording, progeny testing, and recorded show classes, and

these measures must be continued wherever practicable.

The chief danger lies in allowing the importation of inferior stock, but this is recognised by industry leaders. Fortunately the industry has much better facilities and organisation to promote a breed such as the Landrace than ever before.

Through the cooperation of Mr C. E. Sage, Massey, Auckland, a Landrace gilt and her progeny are being subjected to test at the Department of Agriculture's Ruakura Animal Research Station. Further trials are expected to be carried out with other Landrace stock to determine the possibilities of using the Landrace as a boar over the Berkshire-Large White crossbred sow which has been the basis of the hybrid sow scheme to date. The three-bred cross makes better use of the phenomenon of hybrid vigour than the first-cross or back-cross, but the need for another white breed with superior production potential and carcass quality has been felt by progressive pig producers.

Mr W. Risi, Mountley Stud, Ngarua-wahia, is another progressive breeder who has obtained a Landrace boar and intends crossing it with other breeds using an artificial breeding technique which he has developed successfully in recent years. This method of breeding could be of considerable benefit to the industry if the problems of semen storage could be solved, but the progress is not likely to be as spectacular as in the dairy industry.

A sow and boar imported by Mr G. Beale, Ohoka, near Christchurch, arrived in quarantine in August. At a field day in October considerable interest in the breed was shown by South Island farmers.

Other breeders, including the New Zealand Pig Producers Council, have or are interested in obtaining Landrace stock and it is likely that more of these animals will come from Northern Ireland than from Australia, principally because they are cheaper and offer a better selection, though certificates of freedom from atrophic rhinitis, swine fever, and foot and mouth disease are still necessary. Subject to proper veterinary certification of freedom from disease, other breeds can be obtained from the United Kingdom.

However, many breeders believe the long period of acclimatisation to our system of pig keeping that was needed with the Large White breed could also be needed by the Landrace. It will be expected to perform well on a mainly liquid diet as against the largely meal diet in other countries, so that a high standard of management will be necessary. If the market continues to give a premium for superior carcasses, there will be real encouragement to exploit fully the potentialities of the Landrace and give the consumer more uniform bacon rashers.



Liska Prince 2nd, the Landrace boar recently imported from Northern Ireland by Mr Bryce Williams of Hawera. It was Supreme Champion at the Dundalk show last year.

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SERRADELLA is Useful on Light Soil

By H. G. HALLIWELL,

Farm Advisory Officer, Department of Agriculture,
Kaitaia

SERRADELLA, which is a leguminous plant somewhat resembling a vetch, is now well established as a volunteer in Northland, particularly over 286,000 acres in the far north, on the coastal strip at Dargaville, and on the ironstone soils of the Bay of Islands. It is also established as far south as the coastal belt of Raglan County.

SERRADELLA is an annual well suited to light-textured soils such as the consolidated sands and the sandy peats. It is spreading to some extent on to the low-fertility volcanic soils and even to the gumland clays. Under suitable conditions this legume provides a surprisingly large volume of feed during late winter and early spring. It is considered to be most useful as a primary fertility-building species, for it thrives under conditions which are not particularly favourable to red clover and white clover, and when fertility is improved it is replaced by these higher-producing species.

Serradella Group

Eight different species of slender, spreading annuals make up the serradella group of plants, which are native to the Mediterranean region, Western Asia, tropical Africa, and Southern Brazil. Of these eight, the following three have been recorded in Northland.

1. *Arthrolobium pinnatum*, known in Europe as *Ornithopus pinnatus*.

2. *Ornithopus perpusillus*, a small, prostrate, short-leaved plant, sparingly naturalised in gumlands and found as far south as Rotorua. It has little, if any, economic value.

3. *Ornithopus sativus* is the species cultivated in Europe. Its original habitat was the coastal regions of Portugal, Spain, and Morocco. *Ornithopus sativus* was introduced into the Kaitaia district from Brittany in the autumn of 1958. It has been grown with success in autumn-sown seed mixtures at from 2 to 3 lb per acre on the consolidated sands in the Aupouri Peninsula.

However, the serradella dominant in Northland is *Arthrolobium pinnatum* and this article deals with this species.

Growth Form

Serradella is a fairly slender-stemmed, much branched annual of either upright or prostrate growth. At Waiharara in the far north plants have reached 20 in. in height in a closely packed, serradella-dominant sward. Plants often tend to grow together in clumps, each clump consisting of about five individual plants. On light cultivated soils separate stems may run 3 or 4 ft, provided the fertility is adequate. In contrast, on poor, sandy soils the plants are small, in a rosette form, generally singly placed, and tend to show a characteristic bronze colouration. On the heavy clays, where environmental factors are much different, the plant simply becomes one constituent in the mixed sward and has a diminishing value as other legumes become available, because it cannot withstand competition from them.

The leaves of serradella are numerous and pinnate, being elliptic to oblong in shape. These smooth leaflets are arranged in up to nine pairs, oppositely placed, but with one additional terminal leaflet. The stipules



Leaf and flower of serradella.

▼ Nodulation on the roots of serradella.



SERRADELLA . . .

are very small. The flowers are commonly yellow but occasionally cream, with a reddish colour on the outer surface. They vary from two to four in number and are at the head of leafless axillary branches. The pods are small, cylindrical, and curved upward. Outwardly they seem somewhat segmented. These curved pods when dry break into segments containing the yellow seeds, which are difficult to separate from the segments. The plant is a prolific seeder. Serradella possesses a tap root with numerous fine secondary branches.

Introduction into New Zealand

Little is recorded of its introduction and early history in Northland. Small areas were recorded near Houhora at least 40 years ago, and at Dargaville possibly before that. The seed was probably brought into the country accidentally by gumdiggers from the Mediterranean zone.

Over this period serradella has spread and established on the sandy coastal soils in Northland, and the area covered by it, much of which is not topdressed, is extending rapidly.

Growth Cycle

The seed germinates with the autumn rains, and the plants establish during winter, reaching a peak of growth from August to September. The plants flower in October, begin to set seed in November, become fibrous, and die off by midsummer. The plant is not sown in Northland, being purely a volunteer. When there is a particularly wet season plants may continue to grow on until about January. Where conditions are favourable pastures may be dominantly serradella, 20 in. high during September, with some dormant *paspalum* beneath. When its virtues become better known, attempts may be made to sow it on coastal sands elsewhere in New Zealand.

Future Plant Improvement

Overseas work has shown that hybridisation between the various species of the serradellas is possible through pollination by insects. This may assume importance in Mangonui County, where the recently introduced species, *Ornithopus sativus*, appears to have established very rapidly and is already growing in association with *Arthrolobium pinnatum*. In addition the utilisation of strain differences offers considerable possibilities for improvement by selection and breeding.

Freedom from Disease

Serradella does not appear to be attacked by either insect pests or fungi—even on light land lacking humus. A limiting factor in the growing of the cultivated species of serradella in Europe is the fungus



Serradella has prolific growth.

Colletotrichum trifolii, which has not, however, been reported on serradella in Northland.

Nodulation

Serradella nodulates well. It has, incidentally, not been necessary to inoculate the recently introduced species *Ornithopus sativus* on northern sand country which previously grew serradella. There is some evidence that serradella is very efficient as a supplier of nitrogen.

Environment Factors

Serradella has a wide range of tolerance both to soil and climatic conditions. For instance it grows to the seaward edge of foredunes among marram grass right to tide level. It withstands a pH of about 4.7 on the leached Te Kopuru sand, but becomes more vigorous at a pH of up to about 5.5. It does well on sandy peats.

Serradella is singularly efficient in utilising phosphate and potash, and where the light acid soils in the far north have been adequately topdressed with phosphate, potash, and lime results are good.

The plant thrives on the sandier soils recently developed from hakea and

manuka. On the poorly consolidated soils it grows well after a burn. To get maximum development there must be ample light penetration. Fast-growing species which overshadow it when it is not growing well will smother it out of a pasture. It is in this way that serradella is replaced by red clover and white clover.

Value of Plant to Stock

Serradella has become a plant of considerable economic importance in the far north for grazing animals and especially for the dairy cow. It provides fodder on low-fertility soils where red clover and white clover will not exist or where they produce at a very low level. Not only is it a primary fertility-building species, but it also gives excellent grazing returns of protein and minerals at a critical period of the year. Serradella is not particularly well suited for hay, for it is difficult to cut and harvest. It is fundamentally a grazing plant. Under certain circumstances it could be used for silage. The leaf is very palatable. Lambs fatten readily and cattle become glossy and fat on this legume.

Thirty years ago areas of serradella on the loose unconsolidated Pinaki sand on the west coast of the Dargaville district were renowned for their ability to fatten cattle in summer, not only on the green growth but also on the dried-off growth.

Pigs and poultry also thrive on serradella.

The outstanding feature of this legume is that it is able to grow well during late winter and early spring, the seasons of shortages from grassland production.

Carrying Capacity

On Mr J. C. Farnham's property, Waiharara, about 1 acre of serradella carried 23 milking cows for seven days during August. It was fed off on the strip system by use of the electric fence. The value of soil improvement under such a system should not be underestimated.

Serradella is a high-protein fodder providing much needed out of season grazing and at the same time increasing soil fertility. Compared in efficiency with white clover, it will withstand low-fertility conditions. There have been no recorded cases of bloat on a serradella-dominant sward. Evidently serradella has considerable possibilities on lighter soils, particularly of Mangonui County.

The interesting thing about serradella is that it is still spreading to other parts of New Zealand, and one wonders whether or not it will become successfully colonised in parts of the South Island, where quite large areas of the coastal belt have a climate which can be classified as allied to a Mediterranean-type climate.

REVIEW OF RESEARCH and FARM ADVISORY WORK

IN New Zealand with its wide range of climatic conditions and variable soils which are not particularly fertile, the process of farm improvement brings many problems. Research and farm advisory work under these conditions is more difficult than in many other countries where the results from central research stations are applicable to large comparable areas. Many of the problems peculiar to the districts in which they arise have therefore to be investigated by advisory officers. The progress of some of these investigations in the 1958-59 season is recorded in this article, which was provided by Department of Agriculture advisory officers throughout the Dominion. Much of the trial work discussed takes years to complete and interim recommendations or findings often have to be modified as further information is accumulated.

Soils and Fertilisers

SINCE the farming soils of New Zealand have as yet been classified only on a broad basis, advisory officers have found it necessary to make themselves familiar with the soils of their districts in much more detail than on the maps available. They have also to investigate the peculiarities of the various soils in regard to their fertility and management requirements. For this purpose about 1,400 topdressing trials are carried out on farms each year,

and these disclose the main deficiencies for pasture growth.

In most respects deficiencies of the major elements can be correlated with suitable laboratory soil tests, but this is not so with trace elements. For these a field trial or an animal experiment to enable a diagnosis to be carried out satisfactorily is necessary.

Much progress has been made in determining the need for sulphur on certain soils, and though cobalt requirements are well defined in some districts, there are obvi-

Response to sulphur in a topdressing trial in Canterbury. Area at left was topdressed with sulphur and phosphate, that at right with phosphate only.

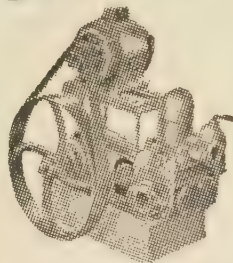


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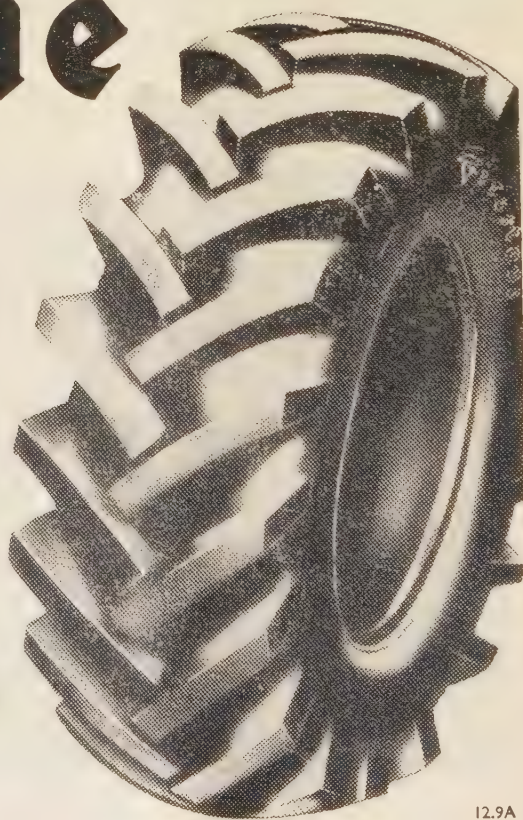
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ously many areas with marginal deficiency. Locating soil responsive to molybdenum has been a major achievement of advisory officers and is resulting in the improvement of many thousands of acres in both islands. It is expected that as time goes on the delineation of soils for other trace elements will be similarly productive, but as the process requires trial work and cannot be satisfactorily determined by laboratory methods, progress has to depend on many years' work.

Sulphur deficiency has been revealed as being widespread and not necessarily relative to soil type, acidity, rainfall, farming history, or many of the other factors so often determining the status of a soil nutrient in any one soil locality. In some instances sulphur alone gives response equal to or better than those obtained with sulphur plus phosphorus, the main ingredients of superphosphate. In others the two major elements are equally important, and more often than not the combination of sulphur and phosphorus is essential, at least initially, to ensure successful pasture species establishment and growth. However, even in these instances, sulphur requirements are frequently greater than would be supplied in the normal dressing of superphosphate and the ratio of sulphur to phosphorus has to be increased. Special sulphur-superphosphate mixtures, containing either 224 or 400 lb of added sulphur per ton of mixture, are now available commercially.

Initially, sulphur deficiencies were found mainly on the undeveloped tussock country, but trial evidence now accumulating indicates that this element is deficient in soils of the plains and downlands. Where soils testing high in phosphate still respond to superphosphate the response is mainly to the sulphur portion of this fertiliser.

One important aspect of this sulphur-phosphorus relationship has been disclosed by recent trials, namely, that for extensive areas of country satisfactory levels of clover establishment and production can be achieved at substantial savings in fertiliser costs by using 1 cwt per acre of added sulphur mixture instead of 2 cwt of straight superphosphate.

There is still no definite answer to the question as to whether or not added sulphur mixtures should be used in "follow up" topdressings. Current investigations should reveal the answer.

Deficiency problems in Canterbury and other parts of the South Island were dealt with in detail in the article "Soil Fertility Problems of Marginal Areas of the South Island", which appeared in the September 1959 issue of the "Journal".

Trial results have given impetus to the use of potash in Southland. Department of Agriculture instructors can advise farmers on the likelihood of obtaining responses, but though fairly accurate information is available on frequency and rate of application, these aspects require further investigation.

Much of the cobalt deficiency in Canterbury is marginal and though soil types where this deficiency is likely to occur are fairly well defined, the Department of Agriculture considers that more trials will be necessary before any general recommendations can be made about the use of cobalt in this area. It asks any farmers who are not satisfied with the thrift of their lambs to get in touch with their local Livestock Instructor so that further trials with cobalt can be organised. The availability of cobalt bullets has made trials easier to conduct.

SULPHUR IN CANTERBURY

USE OF POTASH IN SOUTHLAND

COBALT DEFICIENCY IN CANTERBURY

RESEARCH AND ADVISORY WORK



Part of the Glenmark Catchment Control Scheme. Contoured catchment, with graded bank in the foreground, on the property of Mr J. Carson.

Instructors in the Auckland district have noticed instances where fertiliser-weedkiller mixtures are being used unwisely. If these mixtures are used in such a way that ground is bared by killing of weeds but useful species do not receive sufficient stimulation from the fertiliser portion available, there is loss and no gain. Often better results would be achieved if the expenditure for the hormone portion of the mixture was used for additional fertiliser, often potash. Stimulation of pasture growth by heavier dressings of suitable fertiliser will lead to suppression of weeds such as ribgrass, catsear, and lamb's tongue which come in when fertility is low.

Contour banks are proving most effective for overcoming bad drainage on rolling country in Northland. The Soil Conservation Officer at Whangarei has supervised the construction of such systems on several farms in his area and they are proving most effective in removing one of the chief disadvantages of gumland soils. This type of draining will be equally effective on some limestone country and other heavy, wet soils on rolling country.

Excess rainfall run-off in flash floods that eroded hills and seriously affected farming on the lower catchments has been controlled by the Glenmark Catchment Control Scheme, Waipara, completed last season. This North Canterbury project involved 3,000 acres and 11 property owners, who cooperated with the Department of Agriculture's local Soil Conservator and works unit.

COMBINED FERTILISER AND WEEDKILLER

DRAINAGE OF ROLLING COUNTRY IN NORTHLAND

NORTH CANTERBURY SOIL CONSERVATION PROJECT

TARTAN

Topics

P.10

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DOSAGES: Three alternatives as follows:

1. Control of KEDS and LICE within three months of shearing use:

(a) UNIT CAN PACK: 1 can to 40 gallons of water.

(b) 1 GALLON PACK: 25½ fluid ounces to 40 gallons or 1 gallon to 250 gallons. This gives 0.1% Dieldrin in the spray.

2. Control of KEDS and LICE and protection against BLOWFLY STRIKE within three months of shearing use:

(a) UNIT CAN PACK: 2 cans to 40 gallons of water.

(b) 1 GALLON PACK: 51 fluid ounces to 40 gallons or 1 gallon to 125 gallons. This gives 0.2% Dieldrin in the spray.

3. Control of KEDS and LICE and protection against BLOWFLY STRIKE LATER than three months of shearing OR where BLOWFLY STRIKE is severe, use:

(a) UNIT CAN PACK: 3 cans to 40 gallons of water.

(b) 1 GALLON PACK: 77 fluid ounces to 40 gallons or 1 gallon to 83 gallons. This gives 0.3% Dieldrin in the spray.

TOPPING UP: Keep adding the concentrate at rates recommended as water is used. No further replenishment is necessary.

GENERAL DIRECTIONS: Dosage rates given are based on a spray output of 4 gallons per minute. Should delivery rate of a spray race vary substantially from this figure consult Bulletin G.1 for alteration in dosage ratio required.

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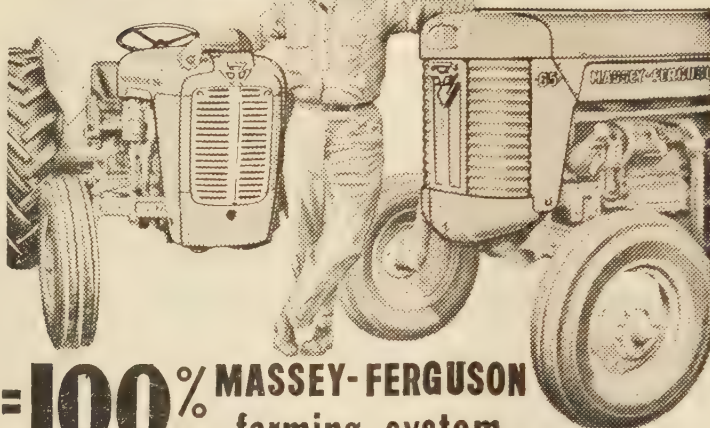
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Systematic conservation practices begun four years ago included pasture furrows, graded banks, grassed waterways, and storage ponds. Associated with these were improvements in ground cover and pasture management. No major flooding or erosion has occurred recently despite rainfall as intense as that which previously caused damage.

Neighbouring farmers are now requesting extension of the Glenmark scheme to the upper catchment.

One of the main sidelines of farming in Southland is the growing of cocksfoot seed. Trials which have shown improved seed yields as a result of using nitrogenous fertilisers have encouraged many seed growers to apply these fertilisers.

NITROGENOUS FERTILISERS FOR SOUTHLAND COCKSFOOT CROPS

The Department of Agriculture is investigating the possibility of seed yields being reduced by thrips. Systemic insecticides are being used in these trials.

Pastures

The drought in the South Island in the summer of 1958-59 resulted in the depreciation of many pastures, while lower prices for livestock reduced the area sown to new pastures and the acreage topdressed in both islands. The introduction of grasses to clover-dominant swards by undersowing or sod seeding was successful in many districts of the North Island during the favourable autumn.

Insects are responsible for a very large share of the failures in grasses and clovers introduced into pastures by sod seeding or undersowing. This has been shown in trials in Auckland Province with a variety of sod seeders. Grass grubs, army worms, crickets, and slugs all take their toll.

SOD SEEDING OR UNDERSOWING

Before sod seeding is attempted the pasture should be examined for the presence of grass grubs. If grass grubs are found, sod seeding should not be begun until the area has been treated effectively with DDT superphosphate. If sod seeding is to take place soon, quick-acting, finely divided DDT should be used and sufficient rain will have to fall to wash it down into the soil where the grubs are feeding. Dieldrin in dusts will deal with army worms or crickets. Control of slugs is expensive.

Trials showed the importance of adequate, but not too much, soil moisture before seeding. Sod seeding was likely to succeed in light soils, but for a good strike on heavy soils conditions had to be perfect unless a pasture desiccant such as dalapon was used. Sod seeding was successful even on a clay soil in dry weather where 5 lb per acre of dalapon was applied at time of sowing. Where no dalapon was used under these conditions no seed struck.

The value of *Phalaris tuberosa* for smothering tall fescue has been proved in at least three areas, at Ruawai flats, at Pipiroa, and on the limestone hills of Rodney County. It is a serious problem in these parts.

PHALARIS TUBEROSA SMOTHERS TALL FESCUE

Phalaris tuberosa, a vigorous grass, particularly when not grazed, was introduced at Pipiroa in Department of Agriculture trials in the early 1930s. It will grow much more robustly and taller than tall fescue.

RESEARCH AND ADVISORY WORK



Phalaris tuberosa growing strongly on a stop-bank where it suppressed and finally replaced tall fescue.

Since *Phalaris tuberosa*, ungrazed, was so effective in combating tall fescue, it was thought it might give similar control under suitable grazing management. This was given a trial on a swamp near Whakatane. *Phalaris tuberosa* and clovers were sown and the area closed from stock. Two cuts were taken for silage but no stock entered the field for about nine months after the *Phalaris tuberosa* was sown. It was grazed thereafter. Only one or two plants of tall fescue survived the smothering effect of *Phalaris tuberosa* and those were on a bare patch near the gate. On a field alongside the trial area which was sown with Italian ryegrass the tall fescue re-established.

Throughout the last 10 years much improvement has been made on the scrub and tussock country in Otago, particularly at Hindon, Outram, and Lee Stream. This development is growing each year as farmers realise the excellent results which can be obtained by modern techniques of pasture improvement and through greater knowledge of soil requirements.

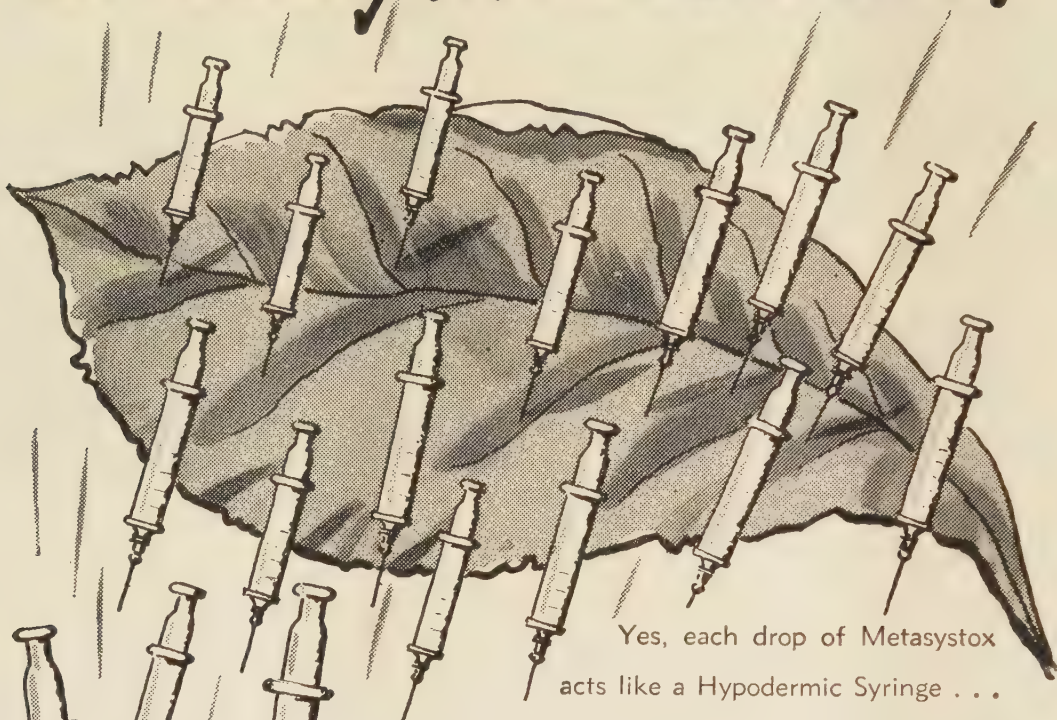
IMPROVEMENT OF OTAGO SCRUB AND TUSOCK COUNTRY

Until fairly recently superphosphate had been used only sparingly on the hills, as the pastures, particularly the clovers, were weak. Since the Department of Agriculture demonstrated the need for molybdenum nine years ago remarkable responses in clover growth have been obtained.

Introduction of clover into tussock country, the best strains to use, and the amount and kinds of fertiliser that would suit particular areas have been major problems investigated. Trials with the principal clover species showed greatly varying results, with baffling failures and unthriftness. The turning point was reached with firm establishment of the need for inoculation. Aerial over-sowing was used with marked success after it had been tested in trials.

Inoculation, ample superphosphate, and molybdenum now all seem essential for successful establishment of clovers on tussock grassland in Otago.

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Greater knowledge of soil requirements and modern techniques of pasture improvement have enabled considerable progress to be made in the last 10 years in the development of scrub and tussock country in Otago.

Most promising results were obtained in a trial in the Middlesmarch district in which 2,4,5-T was used to destroy matagouri. This weed responds to topdressing and cannot be eradicated by cultivation on this type of foothill country because of the stoniness of the soil. Spraying should be followed by aerial oversowing and topdressing.

ERADICATION OF MATAGOURI ON FOOTHILLS

Basal applications of 2,4,5-T oil concentrate in diesel fuel oil (1:80) have given good control of sweet brier in Department of Agriculture trials in the South Island. In Otago the most promising treatment to date has been the aerial application of 3.6 lb of 2,4,5-T acid equivalent per acre followed by basal application of 2,4,5-T in diesel fuel oil. The first part of the treatment opens up the brier and enables the basal application to be made more efficiently.

CONTROL OF SWEET BRIER

Trial work in Canterbury, however, suggests that an equally good but much less expensive control method is to open up the stand in spring by burning and follow this with basal treatment of the regrowth in autumn, using 2,4,5-T concentrate in diesel fuel oil (1:80). If sheep can be concentrated on the area immediately after the autumn basal treatment and throughout the following winter, so much the better. Oversowing and topdressing immediately after a late winter-early spring burn would help sheep concentration the following autumn and winter. The basal treatment applied in autumn would not greatly harm pasture species established from spring oversowing.

As typically infested land is usually of only low value, it is necessary to carry out further work to establish economical methods of controlling sweet brier on such areas.

Ragwort remains the chief weed of the pumice region and parts of the King Country. However, as a direct result of large-scale demonstration work by the Department over the past few years farmers in the Whakamaru and Mangakino districts have made very good progress in controlling ragwort. Farmers have shown quite clearly that they have more confidence in

practical demonstrations on a farm scale than in the results from small experimental plots. Trials have shown the practicability of eradicating ragwort with hormone weedkillers instead of sodium chlorate, which is not so effective. (See article p. 21 in July 1959 "Journal".)

Though not finally completed, results from a trial at Raglan are widely confirmed by observations made throughout Raglan County. It shows that the best method of controlling gorse on unploughable hill country is to confine the gorse to blocks and to wait until these become dense enough for a clean standing burn. Results will be most satisfactory in a dry autumn. The burn should be followed by sowing with 30 lb per acre of a mixture of grass and clover seed accompanied by heavy topdressing with the correct fertiliser and minor elements if required. If this area is well fenced and continuously tightly stocked with sheep from the time of the burn, no spot spraying to control regrowth will be necessary until the second summer after sowing.

GORSE TRIAL AT RAGLAN

With this method the farmer must be prepared to work his sheep and ensure adequate grass areas to support the sheep being used for crushing. A four-wire sheep electric fence is proving invaluable for this work.

The method outlined has proved superior to others including preliminary helicopter and ground spraying with 2,4,5-T followed by burning, oversowing, and heavy topdressing and stocking. This method, beside providing immediate grazing with maximum seed germination, is cheaper than either ground or helicopter spraying now widely used.

Despite dry summers and fairly frequent droughts, irrigation has developed slowly in Canterbury. Hundreds of thousands of acres of water-responsive soils could be border diked, but to date the total area is only 28,000 acres and only 1,500 to 2,500 acres are being added to

AUTOMATIC APPLICATION OF IRRIGATION WATER

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headgates to each border one operator working continuously for long hours can, under average conditions, water up to 24 acres a day only. Because of this serious limitation the Department of Agriculture has been investigating how automatic irrigation could be applied in border dike systems. A method devised by one of its officers is being used in a trial on 160 acres of the Winchmore Irrigation Research Station. This large-scale trial has shown that the new system has distinct possibilities for producing a reliable method that will enable one man working a normal farming day to irrigate a greater area and still be able to do other work.

Farmers in Auckland Province have been disappointed with overhead spray irrigation because of the amount of work required, the growth response, and the cost. Though Departmental officers believe that technique could be improved on many farms, they consider that irrigation is economically justified only on: (a) Very small dairy farms (about 30 acres) where two-thirds of the farm can be irrigated without much difficulty; (b) town supply farms.

However, where a suitable source of water is available irrigation ultimately enables subdivision of existing farms into small units that can be economic. An instance of this is a former uneconomic 30-acre dairy unit which since irrigation has been used is producing 400 lb of butterfat per acre.

Sawdust makes almost a perfect cover for silage. Auckland instructors have found that there is less waste when it is used than with any other type of covering tried so far, including plastic sheeting, which at present is too dear and too easily torn. (See article p. 437 in November 1959 "Journal".)

Departmental officers consider that too much money is being spent on topdressing Wairoa hill country and not enough on fencing. Adequate fencing for satisfactory control of feed is essential. On properties that are adequately fenced and mob stocked pastures improve without superphosphate topdressing. Fencing that allows good control over stock also makes control of manuka and blackberry much easier.

Crops

Severe losses of swedes through dry rot were common on farms in South Otago. Department of Agriculture trials showed that the variety Wilhelmsburger had marked resistance to the disease. As a result this variety has now almost completely replaced Superlative and Grand-master, formerly the most popular varieties in South Otago.

Advisory officers of the Department of Agriculture have done a good deal of work to assist farmers to control pests in field crops in Canterbury and North Otago without danger to bees. Because of the availability of more effective insecticides and means of applying them, spraying of field crops has been done to a much greater extent in recent years. Special regulations had to

RESEARCH AND ADVISORY WORK

be introduced to safeguard bees, but it has been realised that control of pests during a safe period depends on infestations being recognised early. As a result of the Department's advice much of the spraying is now being done during the periods when bees are least likely to be harmed.

Livestock

Facial eczema is a real problem in the Wairoa district, but each year more farmers are following the Department's advice of growing safe crops. The Department has recommended Calder swedes, which are excellent for fattening lambs and have very good regrowth that is available when facial eczema may occur. Most farmers object to confining ewes to small areas when they are due to be flushed and the practice has caused a low lambing percentage.

Growing of crops as a precaution against facial eczema is imperative in this district, but is still not being done as extensively as it should be.

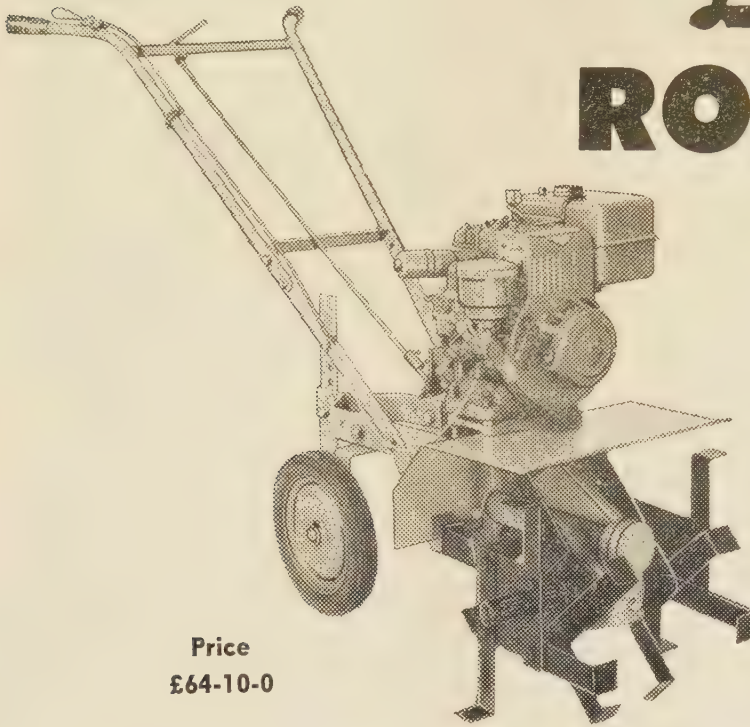
Livestock Instructors in the Gisborne district find that convincing farmers of the need to take precautionary action before serious losses occur is a real problem. For five years at least farmers had been warned of the growing danger from this disease brought about by easier conditions for sheep resulting from topdressing and oversowing and better farming generally. The warnings were virtually ignored. As a result there have been severe outbreaks of enterotoxaemia in the last two years, some farmers losing hundreds of lambs.

The severe losses caused a rush of inquiries at the Department's Gisborne office. Numerous demonstrations and much individual instruction were given in vaccination procedure. Now many farmers throughout the Gisborne district are vaccinating their flocks regularly as a precaution.

The average for the whole county is 80 per cent. As the percentage for the better country is higher, the hill country percentage is obviously poor. This in turn does not allow sufficient young sheep for efficient culling of 2-tooths and often not enough to maintain a flock. Farmers feel that the straight Romney is not the most suitable breed for hill country and the Department has suggested the Cheviot-Romney cross. Though it is rather early to see the results of the change, lambing percentages appear to be improving and wool weights do not seem to have been affected.

Far too many Hawke's Bay lambs are rejected at freezing works because of abscesses arising from vaccination. The Department of Agriculture has impressed on farmers the desirability of vaccinating lambs: 1, mid line in neck above the brisket; 2, on the poll or at the back of the head; 3, in the cheek. Vaccination lesions in these sites can easily be trimmed off when lambs are slaughtered.

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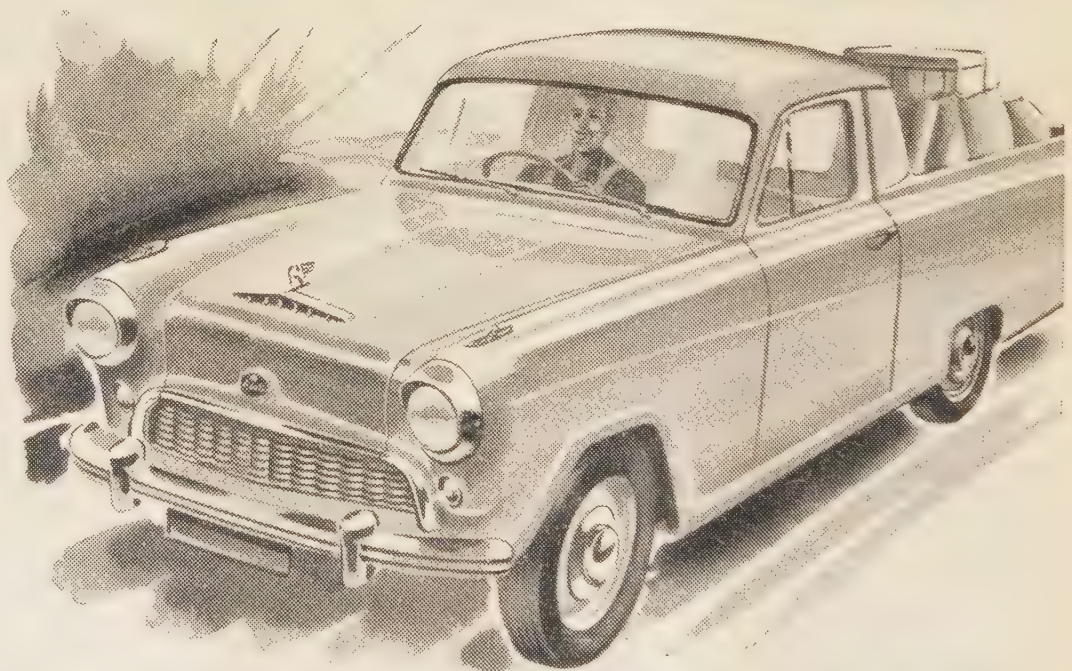
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AUSTIN
10 CWT. PICK-UP

Fewer losses in hoggets through white muscle disease occurred in Otago in the 1958-59 season. Farmers appear to have heeded the Department's advice of the need to allow hoggets a bite of green feed before driving them. The condition was not as serious last season in lambs three to six months old on lush, clover-dominant pastures. There were some heavy pre-natal and early post-natal losses.

WHITE MUSCLE DISEASE

There are encouraging indications that selenium will be of great value in the control of the disease. Some outbreaks in Canterbury have occurred where ewes and lambs were set stocked from lambing onward on lucerne, though among similar ewes and lambs on grassy pastures on the same farms there were no cases.

Deaths of hoggets which have occurred sporadically in parts of Canterbury have often been associated with prolonged feeding on turnips followed by fastings due to yarding or long journeys on foot.

A mild to marked response to selenium has been obtained on the sandy coastal soils of the Manawatu. This was reflected in weight gains in trials with lambs. This experimental work is part of that being done in various parts of the South Island and some North Island areas to test the effectiveness of selenium in controlling ill thrift and white muscle disease. Mild to moderate responses to selenium have also been obtained on stony soils in the Wairarapa. Details of the investigations and results to date were given in an article in the September 1959 issue of the "Journal" (p. 259).

SELENIUM TREATMENT FOR ILL THRIFT

Seasonal conditions throughout the summer of 1958-59 were not conducive to widespread ill thrift in lambs as occurred in parts of Mid and South Canterbury in 1956-57 and 1957-58 (see November 1957 (p. 449) and September 1958 (p. 241) issues of the "Journal").

To discover the causes of ill thrift the following are being studied in South Canterbury:

1. The part of parasitic disease.
2. The importance of enteritis associated with certain bacteria.
3. Incipient cobalt deficiencies and the location of cobalt-deficient areas or soil types.
4. The role of selenium.

In other parts of Canterbury investigations were continued in line with the known causes of the disease there, particular attention being paid to cobalt deficiency and parasitic infestation.

Paradontal disease of sheep was first investigated by M. C. Armstrong, Veterinarian, Timaru, and K. G. Gray, Livestock Instructor, Fairlie, in 1952. Laboratory work was done at Wallaceville Animal Research Station by R. M. Salisbury, Chief Diagnostic Officer.

PARADONTAL DISEASE OF SHEEP

Affected animals have sore mouths and teeth loose or missing. Molars or incisors or both may be affected, but animals suffer most if molars are affected. Animals are reluctant to chew and may die of starvation. No more opportunities for investigations were available until the autumn of 1958, when the disease was reported in several flocks near Fairlie. The incidence in autumn and winter of 1958 was worse than ever before and most farmers were aware of the disease for the first time. In South Canterbury the disease was investigated by Mr Armstrong on 12 farms 10 of which were within 10 miles of Fairlie, one at Pleasant Point, and one at Morven.

The incidence varied from 2 to 8 per cent, the worst being 140 cases in 1,700 sheep. About one of every five of affected sheep died. The disease, which occurs in rams

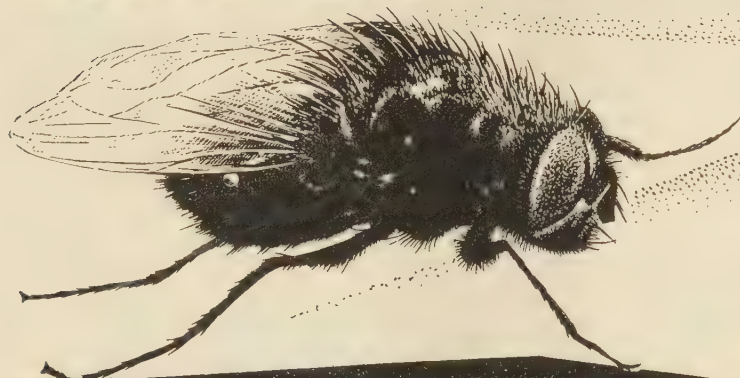


Paradontal disease of sheep. Upper—Facial swelling. Lower—Part of lower jaw with loose tooth and food in tooth cavity (arrow).

and ewes from hogget age upward, has affected Romneys, Cheviots, Corriedales, Border Leicesters, and crossbreds. There is no apparent relation to soil type or carrying capacity.

Dr F. Schroff, Professor of Oral Pathology and Bacteriology, Otago Dental School, and M. M. McKinnon, Research Officer, Wallaceville, visited three of the worst affected farms to assist in determining the cause of the disease. Further observations and research will be necessary before this problem is solved.

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A large-scale footrot trial on a South Canterbury farm organised by the Department and based on the advice set out in Bulletin No. 325 "Footrot in SHEEP" and Bulletin No. 328 "Foot Troubles in Farm Animals" has been successful. An encouraging number of farmers are reporting that they have eradicated footrot from their properties.

Presence of this disease has now been confirmed on 18 farms in South Canterbury. It occurs in sheep over two years of age. The incidence fluctuates from year to year and is usually mild (1 to 2 per cent of breeding ewes). In no case has the incidence exceeded 5 per cent of all breeding ewes. Control by vaccination has been the object of an experiment in a large flock in South Canterbury, and the effect of vaccinating lambs at five weeks of age is being studied. No results are available at present.

Losses in lambs in Otago and other parts of the South Island during hot, dry weather were at first attributed to phenothiazine drenching, but were proved by Department of Agriculture investigations to be due to dehydration. To protect lambs against this danger farmers must try to provide a good water supply in some paddocks at least and shade. Lambs in high condition should not be weaned, driven, yarded, held, crutched, or drenched during very hot weather. Circumstances which have led to losses during dry summers were discussed in the August 1959 issue of the "Journal" (p. 171).

Good progress has been made in Canterbury in the eradication of keds and lice and there has been a continued reduction in the number of flocks found infested at sales. The new tip spray and dusting methods are proving satisfactory. With the new insecticides now available there appears to be no reason why, with the support of all farmers, sheep keds and lice should not be completely eradicated from New Zealand. It should not be forgotten that before the turn of the present century a much more serious external parasite (sheep scab), was eradicated with fewer facilities than are now available to deal with keds and lice. There is much scope for cooperation among farmers in a district to carry out dipping about the same time and so avoid reinfestation from stray sheep. An example of what can be done is shown by results in a sheep dipping scheme organised by Livestock Instructors of the Department of Agriculture in the Christchurch district.

To the south-east of Christchurch lie the Cashmere Hills rising to a height of 1,700 ft. These hills form one side of Lyttelton Harbour. They are broken by steep gullies covered in native bush. In this area there are many small properties carrying a few sheep belonging to owners who work away or to owners who see their farms only during weekends. Owing to the topography and other factors, many of the properties had lice infested sheep.

After Departmental officers had consulted one or two farmers in the area a dipping scheme was devised and a meeting arranged of all farmers. At the meeting an area for the dipping scheme was decided on and it was divided into blocks numbered 1 to 5. Two representatives were appointed for each block to coordinate the dipping for their block and the adjoining one to see that every sheep in the block was dipped and to keep a liaison between all block representatives.

The farmers agreed to dip all sheep in the area between 1 and 28 February and to dip all bought-in sheep, even though they had been sold as dipped sheep.

RESEARCH AND ADVISORY WORK

Dipping was to start at No. 1 block and each block was to carry on in sequence immediately after dipping had been done on the adjoining block. The scheme was adopted wholeheartedly by the farmers and pushed ahead with vigour and enthusiasm.

All owners were interviewed and the scheme explained to them. A circular was sent to all farmers with a map of the district having the block numbers marked and the names of representatives of each block.

Neighbouring farmers cooperated to ensure clean musters. While one property was being mustered the properties on both sides were patrolled to stop stragglers passing from one property to another. All hermit sheep were destroyed. One farmer spent half a day collecting pet lambs from houses and dipping them. No stragglers were returned to their owners without being dipped.

The dipping scheme was an unqualified success. The first dipping under the scheme was done during February 1957 and dipping has been carried out since in much the same way, though the date of completion has been altered to 14 March to coincide with the end of the ewe fairs in the district.

The success of the scheme was undoubtedly due to the drive and enthusiasm of all concerned, but the most important contributing factor was the time limit on the completion of dipping. No lice-infested sheep have since come from this district, which comprises 80 holdings totalling 45,000 acres and carrying 60,000 sheep.

In the past too many calves in parts of the Manawatu were lost or in poor health because of improper feeding. A campaign for better rearing conducted by the Department of Agriculture has produced encouraging results, with better appreciation of the value of rotational grazing, greater cleanliness in calf sheds, and improved feed on many farms.

Farmers on sandhill country such as that at Oroua Downs have had difficulty in rearing vigorous, healthy stock. Copper glycinate injections have given good results on one property. In another trial to overcome severe scouring in young calves, drinking of water has been restricted to half an hour a day and about 1 gallon per calf. Cobalt and iron have been added to the water. The farm has also been topdressed with copperised superphosphate. Even after a week animals showed improvement.

The Department of Agriculture carried out several calf-rearing trials at the Stratford Demonstration Farm during the year. The objects were to:

1. Demonstrate and publicise the recommendations of Ruakura Animal Research Station and to see what modifications, if any, were required to fit the system to central Taranaki conditions.

2. Demonstrate different feeding techniques.

3. Promote the use of buttermilk powder for calf feeding and so help to clear any surplus which could not be sold overseas.

4. Demonstrate that when calves are in poor condition good feeding is essential for recovery and that reliance should not be placed on drenching alone.

Wider interest in calf rearing is apparent and rotational grazing has been adopted more widely. Buttermilk powder has been used so extensively that the Stratford Co-operative Dairy Company had to buy powder to meet the demand. (See articles in the "Journal" for October 1958, p. 352, and August 1959, p. 141.)

Cases of copper deficiency in cattle have been diagnosed in the Greymouth area. Copper deficiency has been corrected in these instances and at Karamaea by injection of copper glycinate. A

COPPER DEFICIENCY few definitely copper-deficient soils have been found in the Waipara, Scargill, and Waikari districts. The technique of using copper cerate injections (resulting from research at the Department of Agriculture's Wallaceville Animal Research Station) has made prevention of copper deficiency much easier than with the earlier methods of drenching or topdressing.

Tuberculosis has been virtually eradicated from town supply herds in Canterbury, Marlborough, and Nelson. The 564 herds in these areas, containing about 29,500 cattle, have passed at least one clear test.

Tb TESTING In the Greymouth district only two herds out of 37 (2,499 cattle) have failed to pass at least one clear test and in Westport only two have failed out of 21 herds totalling 1,262 cattle.

Such results have justified the considerable amount of time given to this work by Departmental officers in the areas mentioned. These officers report that because of the continual risk of reinfection from untested factory supply herds continued cooperation from town supply herd owners in reporting the bringing in of replacements is imperative.

Treatment of an area in the Gisborne district with DDT superphosphate, which was arranged by the local Department of Agriculture Livestock Instructor, has given good control of cattle ticks. The

CATTLE TICK PROBLEM AT GISBORNE DDT superphosphate (wet mix at 20 lb para para isomer of DDT per ton of superphosphate) was applied at 2 cwt per acre after all stock had been removed from the area.

After treatment four men could find only one tick on an area between 2 and 3 chains square, whereas a month earlier 35 ticks were counted on 1 sq. yd. The trial has now been in operation for two seasons and there is still no sign of ticks returning to the treated area.

On this block production has since increased considerably. Five hundred extra breeding ewes and 50 extra cattle are being carried and all stock are healthy.

Before the property was treated both sheep and cattle had a heavy tick burden and were in poor condition.

A trial carried out in the Christchurch area in 1957 showed the new drug furazolidone to be promising for checking losses from pullorum disease in chicks. It has since been used during outbreaks of the disease and has definitely assisted in reducing losses. Wallaceville Animal Research Station has isolated strains from various outbreaks and a New Zealand field strain antigen is now being used in blood testing. With this antigen earlier detection of reactors seems possible. In the 1958 outbreaks of pullorum disease losses appeared to be heaviest during the first three to seven days, not three to 10 or 12 days as previously.

NEW DRUG CHECKS PULLORUM DISEASE LOSSES

For several years farmers at Gisborne were worried about very low calving percentages in beef cows, usually 40 to 45 per cent. Applications made to the Department of Agriculture to supervise the management of herds have increased each year. From inquiries made among all these applicants it now appears that none of the calving percentages is lower than 93.

Increasing Farming Efficiency

The number of requests from Canterbury farmers for guidance on farm management, budgeting, and the economics of farm practices generally is increasing each year. Department of Agriculture officers in supplying information are now able to draw not only on that provided by their training and experience but from data collected by specialist officers of the Economics Section. Several farm improvement and farm recording schemes are operating and from these physical and financial data are collected, analysed, and evaluated. In this way the successful practices of the more efficient farmers can be introduced to those who are operating less efficiently.

There are eight farm improvement schemes in Canterbury, four groups of town supply farms, three with dairy factory suppliers, and one associated with light-land farming. One of the groups in three seasons increased butterfat production per acre by 30 per cent and raised total butterfat production per farm from 10,600 lb to 13,300 lb. In two seasons the light-land group average carrying capacity was raised from 0.56 to 1.7 ewe equivalents per acre, wool production increased from 4.7 to 13.9 lb per acre, and fat lamb meat per acre rose from 8.6 to 24.8 lb. Gross farm income was increased almost threefold.

With the farm recording scheme, input and output data are collected for several seasons from farms representative of various classes of farming. A number of salient features are analysed; costs of many practices contributing toward expenditure and income can be examined and improved methods or redistribution of expenditure suggested to fit in with individual farm management and finances.

Similarly, district surveys are made. Detailed information is collected from most farms within selected areas and from this district averages and averages of the more efficient and least efficient groups are worked out. Factors responsible for efficiency or lack of it are sorted out and the completed survey provides recommendations which are passed back to the farmers concerned, dealt with at discussion days, and published in "The New Zealand Journal of Agriculture".

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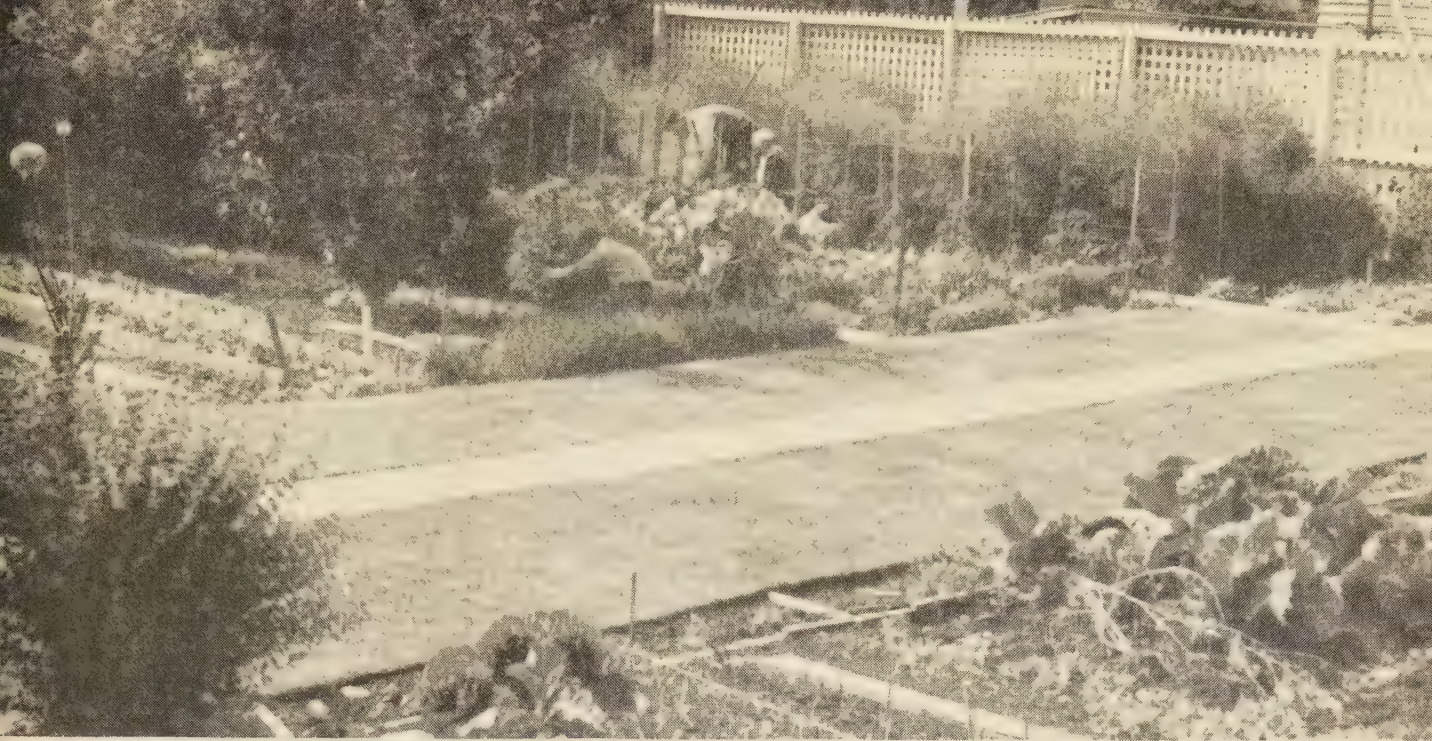
Despite very considerable advances in farming in the last 20 years, a wide range of problems is still under investigation, and satisfactory answers have yet to be found to many practical difficulties. This review shows quite clearly that substantial increases in production of the principal agricultural commodities can be obtained from existing developed holdings both by use of better methods and reduction of waste due to diseases and pests.

Wool Sales

Dates and venues of wool sales up to the end of May are:
 15, 17, and 19 February: Christchurch. 23 April: Christchurch.
 24 and 26 February: Invercargill. 28 April: Dunedin.
 2 and 4 March: Dunedin. 2 and 4 May: Invercargill.
 9 March: Timaru. 13 May: Wanganui.
 23 March: Wanganui. 18 May: Napier.
 28 and 30 March: Auckland. 23 and 25 May: Auckland.
 4 and 6 April: Napier. 30 May: Wellington.
 11 April: Wellington.

Ram and Ewe Fairs

Dates and venues of ram and ewe fairs up to the end of March are:
 19 February—Timaru flock at Timaru (fat breeds).
 23 February—Otago at Dunedin.
 1 March—South Otago at Balclutha.
 4 March—Timaru flock at Timaru (wool breeds).



The Home Garden in February

MOST home gardens are adequately supplied with vegetables during summer and autumn, but the winter and spring supply is no less important. Green vegetables such as cabbage, winter cauliflower or broccoli, the finer sorts of kale or borecole, leeks, and brussels sprouts should now be established so that they reach good size before winter weather slows growth.

By A. G. KENNELLY,
Horticultural Instructor,
Department of Agriculture,
Dunedin

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Cress
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Lettuce
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Kale
Leeks
Savoy cabbage
Silver beet
Winter cauliflower (broccoli)

A SOWING of cabbage and cauliflower for spring use can be made except in the milder northern districts for which later sowing is preferred. Seed of salad crops such as lettuce, spring onions, radish, mustard, cress, endive, and other crops, such as turnips, beetroot, peas, spinach, and silver beet, can be sown where soil conditions are good and the weather is likely to remain favourable long enough to enable the plants to mature. Small sowings of dwarf beans and carrots can be made in favourable situations, particularly in the warmer districts.

Kumara runners should be lifted to prevent their rooting and tall growing tomato plants should be pruned and tied. Brassica crops should be sprayed or dusted to prevent attack by pests. In many districts tomatoes and potatoes will have to be sprayed or dusted with DDT or lindane against caterpillar infestation and with bordeaux mixture, copper oxychloride, or other certified spray materials against fungous diseases.

Few gardens lack vegetables in February, but if the growth of vege-

tables is good, so too is weed growth. Apart from making sowings and plantings which will develop during favourable autumn weather, the most important job in most gardens is to destroy weeds, which if left will suppress all but the most vigorous or mature crop plants. Many weeds produce seed in February and reinfestations from this source may be troublesome throughout the year. Many weeds are alternate hosts for vegetable pests and diseases and help to carry them over from one season to the next.

Vegetables for Winter

There are some variations according to district and situation, but there are usually only four good growing months after Christmas. With garden work so often disrupted by the Christmas and New Year holidays many gardens are neglected during the greater part of January and important garden work is delayed until February. This loss of one of the best growing months may seriously reduce the period for good

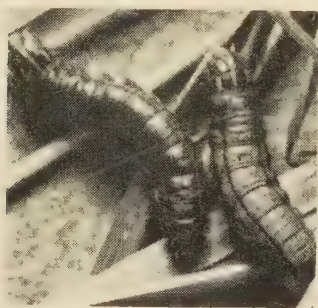
(Continued on page 49)

Heading photograph by Green and Hahn.

Some Soil-inhabiting Pests Troublesome in Home Gardens

Cutworms and Army Worms

Cutworms are smooth bodied, somewhat variable in colour, and sluggish. They are caterpillars of different night-flying moths and are usually from about $\frac{3}{4}$ to $1\frac{1}{2}$ in. long. They get their name from their habit of cutting off young plants at the bases by eating through the stems, though they may also eat into lettuces and root crops such as beetroot. They usually shelter in the soil at the bases of plants during the day and emerge at night to feed.



Army worms.

Army worms are somewhat similar to cutworms and get their name from their habit of advancing in hordes, usually in one direction, stripping crops as they go.

Control: Spray or dust plants or ground round them with DDT or put down poison baits. These can be made up of $1\frac{1}{2}$ lb of bran and 1 oz of paris green (or 1 to 2 oz of arsenate of lead), $\frac{1}{4}$ lb of molasses or treacle, and about a pint of water. This amount is enough to cover about 200 sq. yd. The bait should be used in a day or two, because it becomes mouldy if stored.

Eelworms

Gardeners frequently confuse eelworms (nematodes) with wireworms though, apart from their worm-like shape and habit of injuring plants, the two have little in common. The eelworms that attack plants are mainly microscopic, the largest being only about $1/20$ in. long when fully grown.

The harmless kinds of eelworms that can readily be seen with the unaided eye are sometimes found in the garden. They are usually whitish and may be from about $3/16$ to $\frac{1}{2}$ in. long. They are specially likely to be found in the garden after fowl or other animal manure has been introduced. They usually disappear with the breakdown of organic manure.

Some of the commonest kinds of eelworms destructive to plants cause small, knobby growths on fibrous roots not unlike the nodules on the roots of legumes, pimplly outgrowths on tubers, and swollen, thickened stems on bulbous plants. Affected plants tend to wilt in dry conditions and usually are unthrifty.

Control: Control of the tiny eelworms which attack plants is difficult and usually consists

of fallowing the land for several years or growing only non-susceptible crops. Under glass, control usually consists of steaming the soil or treating it with chemicals (DD or methyl bromide). These methods are not usually considered practicable outdoors because of the cost.

Grass Grub and Cockchafer Beetles

There are a number of species of grass grub, but the adult of the species commonly causing damage is a shiny brown beetle usually about $\frac{3}{4}$ to $\frac{1}{2}$ in. long. Beetles may be found in the soil from September. The first usually emerge in late November and the last usually early in February. They feed on the leaves and flowers of a wide range of plants. Grass grubs and beetles are, however, usually troublesome in the vegetable garden only on soil newly brought into cultivation.

The eggs are laid in clusters a few inches below the surface. They are tiny, oval, and coated with a sticky fluid, which enables them to adhere to dry objects. Eggs hatch in about two to three weeks and the grubs go through three stages, gradually increasing in size and doing ever greater damage to roots until usually from about mid May to October they change into beetles.

Control: Small areas such as lawns and strawberry beds can be proofed against grass grubs by applying DDT or lindane. DDT (50 per cent) can be used as a spray or dust (in a carrier such as dry sand) at 12 oz to $\frac{1}{2}$ acre. Above-ground parts can be protected from beetle injury by spraying them with DDT.

Larvae of the Crane Fly

The larvae or grubs of the long-legged, awkward-looking crane flies, commonly known as daddy-long-legs, are sometimes destructive to long-standing crops. There are several species of crane flies; the grubs, which are commonly called leatherjackets because of their tough skin, are up to about $\frac{3}{4}$ in. long, grey to dark grey or brownish, and have biting mouth parts.

The daddy-long-legs should not be confused with the long-legged, wingless harvestmen, which are beneficial and superficially somewhat like spiders.

Control: As for grass grub.

Millepedes

Millepedes are sometimes wrongly called wireworms from their hard, wiry appearance. They are also often confused by home gardeners with centipedes, to which they are allied but from which they differ in having two pairs of legs to each body segment instead of one pair, bodies more rounded in cross-section, no poison legs, shorter antennae, and no distinct head. They are sluggish and tend to curl up when disturbed, whereas centipedes usually escape by running.

Control: Control, apart from clean cultivation and the removal of rotting or damaged vegetation in which they may breed, consists of trapping as recommended for the control

of wireworms or applying lindane or DDT dusts or dieldrin to the soil.

Subterranean Grass Caterpillars

Subterranean grass caterpillars are often confused with grass grubs, but are the larvae of harmless moths about 1 in. long with wings variably marked but usually shaded black, brown, and tawny. The moths are rather sluggish and at night are often attracted to lights in houses.

The eggs of the most destructive species are small, oval, and usually laid in October. They hatch in three to five weeks. They are white when first laid, but most soon turn jet black.

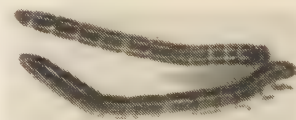
The caterpillars are greyish black. They are very small in November, but up to $2\frac{3}{4}$ in. long by about the end of the following August. During the day they lie in a tunnel they make up to about 10 in. deep, but emerge at night, usually to eat grass foliage and occasionally the foliage of other plants.

Control: The caterpillars can be controlled to some extent by the use of the bait recommended for cutworms, but best results are obtained from use (according to the manufacturer's instructions) of DDT or lindane or dieldrin or aldrin.

Wireworms

Wireworms are worm-like grubs, but are hard and wiry with a segmented outer casing, usually reddish brown or brownish black. They have three pairs of legs behind their heads, which have powerful jaws with which they eat germinating seeds, plant roots, tubers, insects, or even other wireworms. They are the grubs of long, comparatively narrow, hard black beetles.

These beetles usually can be distinguished from the beneficial hunting or ground beetles by the lack of pincer-like jaws and metallic colours and by the apparatus on the under side of the first two segments of their thorax (the middle segment of the body) which enables them when turned on their backs to right themselves with a click, from which has arisen the common name of click beetle.



Wireworms.

Control: In the past for the home gardener control of wireworms has usually consisted of clearing away all rubbish likely to harbour the beetles and the use of baits such as potatoes, seed, or vegetable parts buried an inch or two under the ground and marked with a stick. After a few days the baits are dug up and the wireworms attracted to them destroyed.

In small areas the method is fairly successful on fallow ground, if persevered with, but the most effective control is to dress the soil with either dieldrin or aldrin, DDT, or lindane (sometimes sold mixed with fertiliser).

growth in southern districts, particularly of winter, late autumn, and spring greens, which include Chinese cabbage, leeks, savoy and other cabbage, winter cauliflower (broccoli), kale, kohlrabi, brussels sprouts, and silver beet.

Hardy greens should be regarded by most home gardeners as among the most important crops in the garden as, with forethought, they can be grown so that produce can be harvested from them from late autumn until late spring, when vegetables are most likely to be scarce and dear.

As it is late in most southern districts and the less favourably situated gardens elsewhere for the setting out of winter greens, they should be planted without delay, if this has not yet been done. Success, apart from weather, will depend largely on soil fertility and the use of healthy, well grown plants.

Top growth of asparagus may need support in exposed gardens and this can be provided by stout string tied to stakes driven into the ground at 5 to 6 ft intervals. Weed control is not difficult when the weather is dry, as most weeds are smothered by strong fern growth. Where weeds are troublesome they should be removed by hand to prevent seeding. Beds should not be neglected because cutting is finished. If dry, they should be watered and, though February application is rather late, fertiliser can be applied with advantage if nothing was given after cutting ceased.

Celery plants should receive plenty of water; liquid manure is especially valuable where plant food and water tend to be deficient. Plants must be kept growing vigorously. Where leaf spot disease is troublesome sprays of zineb, copper oxychloride, or other suitable Government certified fungicide should be applied regularly.

Beans

In the more favoured northern districts, where earlier sown crops of beans are now falling off in yield, dwarf or french beans can still be sown. Grown under good conditions dwarf beans come into bearing in about eight to 10 weeks. Early February sowings should be in favourable situations because even relatively light frosts stop the development of beans. Beans grow in a fairly wide range of soils but they need a constant moisture supply.

The soil should be well worked before sowing. A friable, well drained loam reasonably supplied with organic matter suits the crop well. Beans are not usually regarded as gross feeders and generally on reasonably fertile soils only moderate fertiliser applications are needed. On many of the richer soils that are well supplied with nitrogen, a dressing of superphosphate alone, at about 2 oz per square yard, gives satisfactory results, though on



Onions (left) and shallots (right) are ready for harvesting in most districts in February. Correct harvesting (see page 51) has an important bearing on keeping quality.

poorer soils a complete fertiliser is usually advisable. As beans are not deep rooted, water should be given if conditions are dry, as otherwise the plants may be slow in development.

Seed is best sown about 2 in. apart in the bottom of a trench taken out with a hoe about 2 in. deep. February sowings in dry weather should preferably be made a little deeper than early sowings. Rows should be 24 to 30 in. wide. Good varieties include The Prince, Tendergreen, Topcrop, Seminole, and Pearlgreen.

Parsley

Parsley is usually in constant demand and to ensure adequate supplies seed should be sown twice a year in most gardens, in spring and in autumn. Unless two sowings are not made, there may be a break in supply. Parsley responds well to rich, well drained soils and fertiliser is just as necessary as for other crops.

Seed can be sown in rows or broadcast on a small prepared plot, but for best results the plants should be spaced about 8 to 12 in. apart when at the seedling stage. They make quite a good edging and do well in a cool, moist soil in the open or semi-shade. Seed may be slow to germinate, but sometimes germinates quite promptly if it is first soaked or is sown in very moist soil.

Lettuces

In February, in most districts, lettuces are usually best planted out if early maturity is desired. Where conditions are good, damaged and destroyed roots are normally replaced quickly by new growth, but when conditions are dry, as they often are in February, transplanting must be done with care and the plants well watered in.

During the warmer part of the year lettuces are grown in practically all home gardens and with successional sowings or planting they can be grown in most districts to be available throughout the year. Plants must be grown quickly if the leaves are to be crisp. Slow growth or checks to growth cause the flavour to be bitter, and though varieties of lettuce have been developed that have considerable tolerance to hot weather, high-quality lettuce can be produced consistently only where the temperature of the soil and the air is moderately cool while the crop is maturing. Fluctuating high and low temperatures do not permit good growth. With most varieties high temperatures tend to give early seed head development, bitter flavour, and poor hearts.

Lettuces mature in from about two to five months according to growing conditions and varieties, but conditions have to be favourable to produce good

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lettuces in two months. Sowings made to give plants that will mature late in the season should not be large, because though lettuces will tolerate fairly heavy frost, plants severely frosted at or near maturity will have their outer leaves damaged and the plants may be subject to slimy rot.

Manuring

The root systems of lettuce are relatively shallow and though excess water is not desirable, plants should be set out in a moist soil that does not dry out. Practically all soils are improved for lettuce growing by the addition of organic matter. The amount needed varies with the soil type. Loss of organic matter owing to decomposition is rapid in light soils, but heavy soils also need organic matter, as it improves aeration and water movement.

Well rotted farmyard manure gives excellent results, but very heavy dressings, particularly when the weather is most favourable for growth, may result in loose heads. Where sufficient farmyard manure, compost, or similar material cannot be obtained soil can be improved by growing a green manure crop and digging it in early enough for it to rot down before the lettuce is set out.

Unless rotting is fairly complete before the plants are set out, growth may be checked through depletion of the nitrogen in the soil by the bacteria that cause decomposition. On very heavy soils, where the danger of depletion of the nitrogen supply may be outweighed by the advantage of improving the physical condition of the soil, it may be advisable to allow the green crop to mature fully before digging it in. A mature crop contains more fibre than an immature crop and when incorporated in the soil is likely to have a more lasting effect.

If additional fertiliser is needed, blood and bone is likely to give good results on most soils. Alternatively, so-called complete fertiliser can be made by mixing $2\frac{1}{2}$ parts of sulphate of ammonia, $2\frac{1}{2}$ parts of superphosphate, and 1 part of sulphate of potash, all by weight. The complete fertiliser is much more concentrated than blood and bone and it can be applied at about half the rate.

Application can vary from about 2 to 6 oz to the square yard according to the fertiliser and the fertility of the soil. In home gardens a manure which is rich in nitrogen is usually needed most for lettuces. However, too much nitrogen may result in poor hearts and loose leaves.

Soil should be worked to a fine tilth, if seed is sown, as lettuce seed is small and germination is relatively weak. Seeds should be sown thinly (as the first thinning should leave plants about 6 in. apart) about $\frac{1}{4}$ in. deep in rows 12 to 15 in. apart.

Popular varieties for planting in February include Great Lakes, Webbs



To thrive self-blanching celery and climbing beans both need warm, sunny situations in rich, moist, well drained soils.

Wonderful, Imperial 847, Pennlake, and Summer Gem.

Onions and Shallots

Correct harvesting has an important bearing on the keeping quality of onions and shallots, which require similar conditions. Both are generally harvested in February and March. The most suitable time should be determined by factors such as the weather, the condition of the crop, and whether the crops are for fairly immediate use or for long keeping.

If bulbs are to be used almost immediately, they should be lifted as required when they have reached maximum or nearly maximum growth. If they are for long keeping, it is desirable that they should be cured. In this condition the roots and tops should be dried off and the bulbs should be so hard that they are not readily dented by the thumb.

Readiness of onions for harvesting is indicated by drooping of the tops just above the bulbs while the leaves are still green. Gradual dying back from

the tops of the leaves while the necks remain rigid, erect, and thick is an indication of abnormal ripening and usually of poor keeping quality. Insect pests or heredity may be responsible. There is likely to be a percentage of this type in practically all crops.

The roots of healthy, well grown onions ready or nearly ready for harvesting lose their hold on the ground as they gradually die and the necks soften. After the necks shrivel the leaves gradually turn yellow and dry off, even if the onion is not harvested.

If the onion bulbs dry off prematurely, the necks of the bulbs may remain open and allow various organisms which cause rots to enter. Premature drying off of the bulbs may be due to injury by heavy infestations of thrips or by damage to the roots by hoeing, though growers sometimes hoe off the roots to cause premature death of the leaves and thus speed the drying off of the crop so that harvesting can proceed.

YOUR HOGGETS, FRED, ARE SAFELY STOWED . .

...they're down No. 3 Lower Hold—that's a refrigerated hold, Fred—and from now on they'll be looked after by Harry Briggs, the Chief Freezer, and his team. There's a lot of things going on now that might distract Harry, but Harry is quite oblivious of them all. He's got just two things on his mind—his fiancée over in New Plymouth (a nice little thing, all smiles and auburn curls) and your hoggets.

Frankly, Fred, he prefers thinking about his fiancée to worrying about your hoggets;

but your hoggets are his job. He's a highly skilled man, Harry. Got a pride in his work and his responsibility. That's why he's down there at his control panel now. The hatches are on No. 3 and they've been properly sealed. From now on, it will be Harry's job to see that your hoggets travel at the right temperature—which is about 15°F. But don't worry, Fred, Harry knows his job and he'll get your consignment to London as saleable as it was when it was put into his care.

Incidentally, your hoggets at the moment are in exactly lat. 39° 29' South, long. 176° 55' East, that is to say, tied up to Geddis Wharf in Napier Harbour.

Your hoggets, Fred, are waiting for the evening tide.



FRED MACKENZIE

is a fictitious character. In these advertisements, he stands for all New Zealand farmers, whether they be concerned with meat or wool or fruit or dairy produce. The story of his hoggets is the story of all New Zealand produce which is shipped to markets overseas.



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Except in a few areas conditions in New Zealand are rarely ideal for harvesting onions and it may not be possible to wait until the crop reaches the best stage for harvesting. Early frost is a risk in some districts. Light frosts do not harm onions, but heavy frost may cause severe injury.

Onions with thick necks or that have not closed at the neck or bulbs left to dry that have been subjected to showers or to heavy dews are likely either to rot or take root again. Where conditions for drying are not likely to be suitable, onions should be dried or cured under cover.

Drying or curing usually takes three to four weeks. In the lower-rainfall districts where a spell of fine weather in autumn is likely, bulbs can be left on the ground. The tops should be left on to give them some protection from the sun. If rain falls or there are heavy dews, they should be turned to enable them to dry evenly and to check rots, sprouting, or discolouration by the wet soil.

After drying it is usual, though not essential, to top onions by cutting or twisting the tops $\frac{1}{4}$ in. from the bulbs. Twisting is preferable, as it closes the top of the bulb and the twisted leaves act as a barrier to the entry of rot-producing organisms. Alternatively, the bulbs can simply be gathered when dry and packed in open-mesh bags or in shallow open boxes or strung and hung in a dry, airy situation.

Though more space is needed for untrimmed onions, the tops are useful for cushioning the bulbs during handling and also in retarding the progress of rots which may develop. Where the weather is not favourable



[Sparrow

The popular oxheart type of spring cabbage.

for curing in the field or with varieties, such as some of the white onions, that are difficult to cure it is advisable to dry the bulbs in an airy shed or in open-mesh bags or boxes.

Peas

Quick-maturing varieties of peas such as Little Marvel (also known as Utility), William Massey (Early Crop, Kelvedon Wonder, Earliest of All) can be sown in most districts early in February to mature before winter. Situation and soil conditions should, however, be favourable in most dis-

tricts to ensure that the crop matures, as the early onset of winter conditions may check growth. Good soils and cultural conditions as advised for beans suit peas.

Spring Cabbage

Except in a few northern districts where the winters are mild, the home gardener regards spring cabbage as cabbage of the smooth-leaved, pointed, or oxheart type which is usually sown in autumn and overwintered in the open for cutting in spring. In mild districts where the smooth-leaved, round varieties can be overwintered successfully, these cabbages also may be termed "spring" cabbage.

Because the pointed type of cabbage is hardy, relatively quick maturing, succeeds in a wide range of conditions, and is especially suited to autumn sowing in most parts of New Zealand, it is probably more popular in home gardens than any other cabbage except the savoy. Good varieties mature quickly under favourable cultural and climatic conditions, for though cabbage is primarily a cool-weather vegetable, growth is greatly accelerated by moderately high temperatures if there is adequate moisture and the soil is rich in plant foods.

Maturity time varies widely with an average of about 16 to 18 weeks. If temperatures are low and cultural conditions unfavourable, the plants may take up to about seven months from seeding to maturity, but if conditions suit them they may mature in considerably less than 16 weeks. This ability to succeed under a wide range of climatic and cultural conditions (though it is not possessed equally by all varieties) makes the pointed type of cabbage so popular.

(Continued at foot of page 54)

Meteorological Records for November

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches						
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		Bright sunshine hours	
				Maximum	Minimum				Amount	Date		
Kerikeri	240	60.9	+ 1.8	75.6	40.8	2.15	10	- 1.69	1.37	18	172	
Auckland	160	61.8	+ 1.4	72.8	49.0	1.56	6	- 1.74	0.51	10	191	
Tauranga	14	59.4	+ 0.6	74.0	41.2	1.82	8	- 1.62	0.96	18	210	
Ruakura	131	57.8	+ 0.4	72.3	37.2	1.73	11	- 1.95	0.52	18	169	
Whakarewarewa ..	1,006	57.0	+ 0.5	72.8	35.2	2.93	10	- 1.22	0.88	6	192	
Gisborne	14	59.8	+ 0.8	81.3	36.2	0.97	10	- 1.62	0.24	6, 10	264	
New Plymouth ..	160	57.4	+ 0.6	67.8	42.0	3.86	12	- 0.85	1.20	18	159	
Karioi	2,125	52.3	+ 0.4	69.5	29.5	2.47	12	- 1.39	0.72	6		
Napier	5	61.0	+ 1.4	83.9	39.9	1.61	6	- 0.48	0.43	10	254	
Wanganui	72	58.3	+ 0.1	76.6	39.9	1.56	9	- 1.06	0.48	6	196	
Palmerston North ..	110	57.6	+ 0.7	72.0	37.5	2.84	16	- 0.02	0.90	29	121	
Waingawa	340	56.3	+ 0.2	74.0	32.0	1.20	9	- 1.50	0.32	18	224	
Wellington	415	55.8	+ 0.0	68.0	41.8	2.10	8	- 1.27	0.94	18	175	
Nelson airfield ..	5	57.4	+ 1.9	74.9	39.1	0.98	9	- 1.95	0.47	18	228	
Blenheim	12	59.8	+ 2.9	81.0	35.9	0.81	9	- 0.90	0.36	18	236	
Hokitika	15	53.5	- 0.3	63.9	40.1	12.28	18	+ 2.35	2.22	5	181	
Hanmer	1,270	56.0	+ 2.2	77.8	32.7	2.03	13	- 1.45	0.79	29	215	
Christchurch	22	58.8	+ 2.5	81.2	39.0	0.55	9	- 1.27	0.20	29	224	
Ashburton	323	59.0	+ 3.3	88.6	33.2	1.68	11	- 0.77	0.35	6, 8	210	
Timaru	56	57.7	+ 2.2	81.0	34.5	2.06	11	+ 0.11	0.79	8	213	
Alexandra	520	57.7	+ 1.3	82.1	32.1	1.16	6	+ 0.08	0.79	8	205	
Taieri	80	55.1	+ 1.7	84.4	32.0	2.95	15	+ 0.67	1.43	8	158	
Invercargill airfield ..	0	52.6	+ 0.8	73.4	31.5	4.27	19	+ 0.63	1.13	8	164	
Chatham Islands ..	150	51.8	- 0.2	62.2	38.0	1.49	13	- 0.74	0.48	29		

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during September 1959 and for the 2 months ended 30 September 1959 with comparative figures for the same month and for the 2 months of 1958 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER					
Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage inc. or dec.	
September 1959	18,909	316	19,225	—	
September 1958	19,902	268	20,170	—	
Increase or decrease	—993	+48	—945	—4.685	
2 months ended 30/9/59	29,445	450	29,895	—	
2 months ended 30/9/58	31,322	374	31,696	—	
Increase or decrease	—1,877	+76	—1,801	—5.682	

Butter in store at 30 September 1959 was 9,522 tons

CHEESE					
Period	White (tons)	Coloured (tons)	Total (tons)	Percentage inc. or dec.	
September 1959	6,732	1,661	8,393	—	
September 1958	5,417	1,328	6,745	—	
Increase	+1,315	+333	+1,648	+24.432	
2 months ended 30/9/59	8,658	1,717	10,375	—	
2 months ended 30/9/58	6,837	1,365	8,202	—	
Increase	+1,821	+352	+2,173	+26.49	

Cheese in store at 30 September 1959 was 7,941 tons

If these figures are converted into butterfat equivalent, there is a decrease of 2,322 per cent in butterfat graded for the 2 months as compared with the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place they are not necessarily a true indication of production trends.

Home Garden

(Continued from page 53)

The first autumn sowing of cabbages for overwintering in the open should be made in February, except in the milder northern districts, where a first sowing can if desired be made in March. Plants should be ready for setting out about six weeks after sowing.

Home gardeners often set plants out when they are very small. This gives satisfactory results if the garden is sheltered or conditions are very favourable. Plants should be sturdy and well developed and should be lifted with a fibrous tuft of soil and roots. Plants with no growing points or very weak plants should be discarded. Under some conditions plants with coarse, thick taproots may develop better if about 1 in. is cut from the root end.

Where winter temperatures are low (40 degrees F. and down to freezing point) for considerable periods sowing must be timed carefully to produce plants that are neither too large nor too small. For this reason February sowing is preferred in most districts.

Plants for setting out in late autumn in districts where winter conditions are severe should be sturdy and well developed with stems about 3/16 in. thick but not much larger. Smaller plants may be killed or severely checked by prolonged low temperatures and severe winter weather.

The seedbed should be dug over and cultivated to a fine tilth. Soils lacking humus should be dressed with compost or well rotted farmyard or stable manure. However, manure should be thoroughly incorporated, as germinating seed may rot if it comes in contact with a considerable quantity. Cabbage seed should be sown 1/4 in. deep in rows about 12 in. apart. It can be broadcast,

but the plants are then more difficult to weed and usually a little more difficult to lift.

Varieties

Varieties such as Flower of Spring and Jersey Wakefield are among the quickest maturing; Enfield Market is classed as second early and normally matures about a fortnight later. Flower of Spring is the most suitable for a wide range of conditions and is very popular particularly in southern districts.

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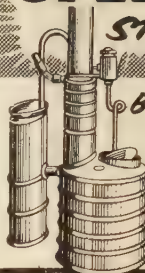
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Sward Management in Grassed Orchards in Hawke's Bay

By T. CONWAY,

Instructor in Horticulture, Department of Agriculture, Hastings

ABOUT 25 per cent of Hawke's Bay's fruitgrowing area has now been grassed down and management of swards is accordingly becoming an increasingly important aspect of orchard management. Recommendations based on experience in the district are given here.

IN the spring and summer following sowing the sward must be given careful attention for good results. If ryegrass or prairie grass has been included in the seed mixture, the new sward should be close mown or hard grazed a few weeks after it has become established to prevent young clover seedlings from being smothered. This will do much to ensure a reasonably clover dominant sward. Further mowing or grazing should then be continued as required throughout spring and summer, but growth should not be kept shorter than 2 in. during summer. The sward should be mown when it reaches a height of about 6 in.

In subsequent years sward management should aim at the maintenance of a good ground cover compatible with tree requirements. Mowing should be carried out from September to February or even later if a late flush of growth in late summer and autumn interferes with harvesting.

About 12 to 14 cuts a season will be needed with intervals between mowings of 10 days in spring, increasing to about a month in late summer. Frequent cutting in spring and early summer is essential to reduce competition with the trees for moisture and soil nutrients and to give light and air

to the clover in the sward to ensure that the clover can develop.

During summer, cutting too close to the ground should be avoided; adjust the mower to leave about 2 in. This cover of vegetation will keep the ground cool and will further encourage the spread of clover.

In autumn, except during a drought, cutting should be reduced to a minimum. For trees in active growth some competition from the sward for nitrogen and moisture is beneficial in autumn, as it assists in maturing the wood and improving the keeping quality and colour of late fruit crops. Growth in autumn and winter is also necessary to build up the quantity and increase the depth of grass roots. Prairie grass requires grazing or mowing during winter, because this is its main growth period.

A heavy harrowing of the sward in late autumn is advisable to open up the soil crust and allow better aeration of the soil, better drainage, and to help root growth of the pasture plants to extend.

Fertiliser Requirements

Fruit trees in grassed orchards usually need heavier applications of nitrogenous fertilisers than those under

cultivation, though requirements will vary according to age and condition of the pasture and trees, the predominance or otherwise of clover in the sward, and the extent to which sheep are grazed. However, though nitrogen is important, too much can cause excessive growth and poor keeping quality in fruit, particularly in Cox's Orange and allied varieties.

About double the normal applications of nitrogen appear necessary in the first two or three years, but after that much of the nitrogen needs will be provided by the clover and sheep droppings if the area is grazed.

As sulphate of ammonia severely depresses clover growth, non-acid nitrogenous fertilisers of the ammonium nitrate plus calcium carbonate type are being widely used on orchards. The fertiliser can be applied in the spring following sowing down and each subsequent spring. The addition of superphosphate and potash is also advised to provide a reasonably balanced fertiliser.

Liming should not be done unless a soil test shows the need for it.

Mulching

Mulching under the trees with straw or other material is often done for a few years before grassing down or later in association with maintenance of a sward. It may be valuable in preventing a check to tree growth after grassing. In addition a mulch helps in the early establishment of young replacement trees in grassed orchards.

Some consideration should be given to the cutting of the sward, if clover is flowering profusely just before spraying with toxic insecticides. This precaution will keep faith with the beekeepers, who provide valuable pollinators, which are essential to ensure regular and heavy crops of fruit.

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Crop Production



PEAS

THE pea crop has long been important in New Zealand, and after the end of the Second World War over 50,000 acres were being grown annually for threshing. More recently this acreage has fallen to about 30,000, but the utility of the crop has been widened with the development first of the canning industry and later of the quick-freeze industry.

THE growing of peas for threshing can be divided into two sections, one section dealing with garden varieties essentially for the supply of seed and the other with field peas. Most of the garden pea seed has been exported, principally to the United Kingdom and Australia. Small quantities have been retained in New Zealand for the sowing of the following season's seed crop and for use by market and private growers to provide green peas. With the development of the canning and quick-freeze industries the quantities of seed required have increased considerably and new varieties have been introduced to meet the particular needs of these industries. Even so, New Zealand's export of garden pea seeds still approximates 300,000 bushels per annum, valued at over £500,000 and is estimated to represent more than 80 per cent of the crop.

Two main types of field peas are grown—blue (or food) peas, which are used mainly in the packet pea trade, and maple peas, which are processed into split peas and are also used for pigeon feeding. A few white peas are also grown for processing into split peas.

By J. P. BEGGS, Farm Advisory Officer, Department of Agriculture, Blenheim, and P. R. BARRER, Farm Advisory Officer, Department of Agriculture, Christchurch

Separate statistics of the various types of peas grown for threshing are not available, but it is probable that

▲ Special blocks to produce nucleus seed are sown in wide drills and carefully inspected for off-type plants.

the decrease in the acreage of blue and, to a less extent, of maple peas accounts for most of the reduction in acreage of peas for threshing in recent years.

It is estimated that about 1,000 tons of each type of field pea are used for local consumption every year, while exports comprise about 200 tons of blue and 5,000 tons of maple peas annually. The value of the exports exceeds £250,000.

The growing of peas for threshing is confined to districts with suitable climates for ripening and harvesting the seed. It is therefore not surprising that Canterbury, with its large area of cropping land, has the largest area, while Marlborough comes next. In Marlborough pea growing for seed is probably more concentrated around the Blenheim and Seddon areas than anywhere else in the country. Less important areas are Wellington and Otago. In the once-important areas



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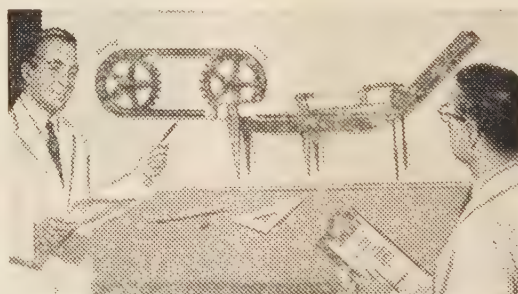
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of Nelson and Gisborne areas have decreased markedly in recent years.

Before the introduction of the canning industry the growing and marketing of green or immature peas for consumption were done almost entirely by market gardeners. The larger requirements of the canners have caused the production of this type of pea to spread to larger areas and to farm-scale operations. Further expansion has followed the introduction of the quick-freeze method of processing peas for market. In 1957-58 about 11,000 acres of green peas were grown for the combined requirements of the quick-freeze and the canning industries.

The growing of this crop is localised around the canning and quick-freeze factories which have been established at Pukekohe, Te Puke, Gisborne, Hastings, Nelson, Motueka, Blenheim, Christchurch, Timaru, and Dunedin. Over half the total area grown is in the Hastings district. Growing of such peas appears to offer the best opportunity of further expansion, but this is dependent entirely on export outlets.

Sidelines to the utilisation of the pea crop described include conversion into silage for stock feeding of the vines left after harvesting green peas, use of threshed straw for rough fodder and bedding for animals, and conversion into stock food of undergrade peas and pea offals resulting from the threshing and dressing of ripe peas. The crop is also occasionally grown as a green fodder crop and in combination with a cereal as a hay crop.

Contract Growing

Most pea crops in New Zealand are grown under contract. Peas for threshing (particularly the garden varieties) are grown under contract to seed merchants, who in turn receive forward orders from overseas buyers. The merchants enter into contracts with farmers to meet their seed requirements for this trade, supplying the parent lines of seed to be used. They also attend to any roguing necessary, machine dressing, and hand picking of the product if required.

Crops for quick-freeze and canning are grown on contract for the processing factories. Generally the factories supply the seed for sowing from stocks obtained from seed merch-

ants, prescribe the sowing date to ensure spread delivery of the crop to the factory, and attend to the vining of the crop and carting of the product to the factory.

Varieties and Classification

Many varieties of peas, particularly garden peas, are listed in trade catalogues. Varieties are listed as first early, second early, early main crop, main crop, late main crop, and late, and though the number in each section is a great joy to the keen amateur gardener, who must try them all, it is only a source of confusion to the not-so-keen.

Often one variety will have two or more names. Greenfeast, for example, is also known as Lincoln and Home-stead, and other listed varieties are often found to be merely slightly varying strains of the one variety.

The following list groups the more common varieties of peas grown in New Zealand according to their utilisation:

A. Garden Peas (ultimately used green)

1. Early maturing—

*William Massey
Little Marvel
Blue Bantam

2. Mid-season maturing—

*Greenfeast
*Onward
†Victory Freezer
†Dark Skinned Perfection
†Wyola
*Hursthouse

3. Late maturing—

Stratagem
Lord Chancellor

* Used both for the garden and in the canning and quick-freeze industries.

† Developed primarily for the canning and quick-freeze industries.

... PEA PRODUCTION

B. Field Peas (ultimately used dry)

1. Blue peas—

Blue Prussian
Harrison's Glory

2. Maple peas—

Partridge
Marathon

3. White peas—

White Ivory
White Prolific

Merchants are still contracting for various other varieties which may be grown by the farmer under numbers instead of names. Often, too, firms in England and Australia send out lines of seed to New Zealand merchants to be grown for seed production, all the produce being returned for sowing in those countries. Many such varieties are not suited to New Zealand conditions, and are not grown to any extent as a market garden crop in this country. Varieties grown on contract to overseas firms to a small extent include Laxton's Progress, Thomas Laxton, English Wonder, Witham Wonder, Alderman, and Senator.

The main pea varieties of different types or maturity are:

Garden Varieties

William Massey is the chief early pea for local market garden use and for export, and in some areas is grown for quick-freeze. It combines excellently with Greenfeast when sown at the same time, as it is ready to pick before Greenfeast. It has a wide range of adaptability to soil and climate, but requires higher-fertility conditions than Greenfeast. William Massey produces a fair crop of good peas and is resistant to pea mosaic disease. Endeavours are being made to develop by breeding a similar type with higher yield.

Greenfeast is a hardy variety which yields well, has wide adaptability, and deserves pride of place in the garden. It is widely grown commercially, both for seed for export and for quick freeze. The pods are curved and the peas dark green and of good quality. Its main weakness is that it is susceptible to mosaic disease, though this disease appears to be important only in Marlborough. Ordinary stocks are susceptible to

Features of Pea Growing in New Zealand

Area Grown

About 30,000 acres for threshing
About 11,000 acres for processing as green peas

Main Growing Districts

Canterbury and Marlborough for threshing
Various localities adjacent to factories for processing

Most Suitable Soils

Sweet, friable, well drained loams with high humus content

Varieties

Garden and processing: William Massey, Greenfeast, Onward, Victory Freezer, Dark Skinned Perfection

Field peas: Blue Prussian (boiling); Partridge (splitting and pigeon feeding); White Prolific (splitting)

Normal Sowing Rates

Seed: 3½ to 4 bushels per acre (garden varieties) and 2½ to 3 bushels per acre (field varieties)

Fertiliser: 1 to 2 cwt of superphosphate or equivalent per acre; up to 5 cwt in some districts for processing

Normal Sowing Period

September-October

Average Yield

30 bushels (threshed peas) per acre

1½ tons (green peas) per acre

Commercial Bushel Weight

60 lb (dried peas)

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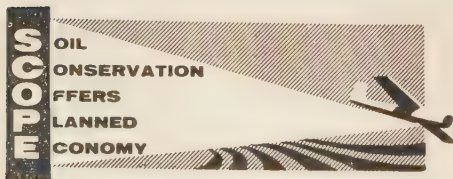
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Victory Freezer, which is grown in New Zealand under several synonyms, has been bred for evenness of development of the pods for picking in the green stage, and for this reason it is particularly suitable for use in the quick-freeze and canning trades. It is a vigorous grower and matures about a week earlier than Greenfeast. It has a fairly straight and blunt pod and is a good yielder.

Onward is a mid-season type showing good adaptability and producing good yields of large peas. The pods are large, puffy, and blunt-ended. It is a good variety for table use.

Stratagem is a late-maturing variety which produces a dark-green pea of good quality. The pods are straight and the yield good. Though this is an ideal culinary pea, its use in recent years has greatly decreased.

Field Varieties

Blue Prussian is a boiling variety which was fairly widely grown for military needs during the war. It has lost popularity on the English market owing to its smallness and varying degree of hardness, but is used locally in the packet trade.

Harrison's Glory is a marrowfat type, larger than Blue Prussian, commonly used as a packet pea for boiling. The seed is blue and dimpled.

White Ivory has white skin and yellow cotyledons and is very suitable for processing into split peas. It is not widely grown in New Zealand on account of its low yield.

White Prolific, bred by the Agronomy (now Crop Research) Division of the Department of Scientific and Industrial Research, is also very suitable for processing into split peas.

Partridge: The flower of this pea is coloured and the seed itself has a coloured coat and yellow flesh. This has been the most widely grown variety in New Zealand. It is used locally in the split-pea trade, though it is not as good as the white pea for this purpose. It is typically a dimpled variety, but lines are preferred as nearly smooth as possible, as this facilitates polishing after splitting. In England these peas have been used mainly for pigeon feeding, but more recently a large proportion is being used for human consumption.

Soil Type and Climate

The pea crop is risky because its success depends so much on suitable soil and climate. Extremes of wetness or dryness may cause a complete failure, and humid conditions may result in heavy growth of foliage and a poor yield of seed, particularly with the Partridge variety, which as a result is usually grown on lighter land.

Conditions are ideal for peas when the atmosphere is mild and reasonably



A crop of garden peas for seed in full flower in Marlborough.

dry and the soil moist. Frosts do not injure the crop except at the flowering period, when the setting of seed may be seriously affected. In Canterbury hot, dry, north-west winds during the flowering period can seriously reduce the yield; moist conditions, which stimulate flowering, are beneficial at this time.

The ideal soil is a "sweet", friable, well drained loam with a high humus content. Heavy, clay soils are unsuitable, but if rainfall conditions are suitable, sowings on fairly light land can be successful. Very rich soil like that in "holding" paddocks encourages growth of much foliage and little seed.

Garden peas are more susceptible to adverse conditions than field peas; many garden varieties are suited only to localised conditions, though others like Greenfeast have a wide adaptability.

Place in Rotation

The pea crop can be very valuable in the cropping rotation, but its use

can be overdone. If it is used suitably in the rotation, much of the uncertainty about the crop is removed.

Without a doubt peas do best after grass. At this stage the soil is rich in humus and accordingly in moisture-retaining properties. This is important if dry conditions continue while the crop is growing. It is important too if there is wet weather shortly after sowing, as a humus-rich soil does not run together and cake as badly as a cropped-out one. Serious weed competition is also less likely after pasture than after crop.

Peas also frequently follow a green-feed crop or a cereal, and in Canterbury, they are occasionally autumn sown (April-May) after a potato crop.

The natural crop to follow peas is a cereal, and the cultivation required for wheat after peas is simple and inexpensive. In recent years the practice of sowing down to pasture immediately after harvesting of the pea crop has increased.

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Preparatory Cultivation

Preparatory cultivation for peas should begin early. After pasture, skim ploughing or grubbing should be done in early autumn and deep ploughing should follow early enough to allow ample time for the frost to work the soil during winter. The amount of spring cultivation necessary for seedbed preparation is greatly reduced if ample time has been given for the natural weathering of the soil.

As turf brought to the surface after deep ploughing is a handicap during harvesting, discs are sometimes used in preference to the grubber for surface working. The final seedbed should have a good tilth underneath, but the surface should not be too fine. A rubbly condition is desirable on top. Use of the roller cannot be recommended either immediately before or immediately after drilling.

In paddocks which have been seriously attacked by grass grub skim ploughing in autumn may not be necessary.

Also, when the preceding crop has been potatoes or green feed cultivation is naturally speeded up and simplified. In parts of the North Island, too, preparatory cultivation may not require to be as protracted as in the south.

Lime and Fertiliser

In common with other leguminous crops such as lucerne and clovers, peas thrive on "sweet" land. After recently limed pasture no more lime is neces-

sary at time of sowing, but if lime is likely to be deficient in the soil, it is good practice to drill 2 cwt with the seed. Where the lime deficiency is known to be high 1 ton per acre, applied after deep ploughing and well ahead of drilling, will be beneficial.

Fertilising practice varies from district to district, depending on soil deficiencies. However, the normal manurial treatment is 1 to 2 cwt of superphosphate per acre drilled with the seed. Sometimes reverted or serpentine superphosphate is used. In the Pukekohe district peas for canning are frequently sown with 4 to 5 cwt of serpentine superphosphate per acre.

Some growers who consider it is not good practice to drill the fertiliser with the seed broadcast it on the seedbed before sowing.

The use of nitrogenous fertilisers is not recommended.

Seed Treatment

Peas, particularly garden varieties, are subject to pre-emergence attack by fungi. To combat this trouble seed treatments incorporating one of the fungicides thiram, captan, or chloranil are available.

Seed treatment is a wise precaution, especially when seed is drilled early or when wet soil conditions are likely to follow sowing. Seed treatment is also reported to give partial control of collar rot disease.

Sowing

Spring weather often controls the time of sowing pea crops intended for

TREATMENT OF SEED FOR PEA CROPS

threshing, but in Canterbury October is the main seeding month for commercial sowings. Early sowing, either in late September or early October, is preferable if the soil is warm enough, for peas do not thrive if sown late when the weather is dry and hot. November or later sowings are necessarily confined to heavy land. September sowings are more common in Marlborough than in Canterbury.

Early sowing is most important with late-maturing varieties such as Partridge. As this variety is normally sown on lighter land than are garden peas, it is possible to sow it earlier. In Marlborough field peas are sometimes sown as early as April or May, and in Canterbury some autumn sowing is also carried out after potatoes, but this practice is not common.

Crops for canning or quick freeze in any particular district are necessarily sown in rotation so that they will mature in reasonable succession to permit ease of handling for harvesting and processing. The normal sowing period is from August to early December, but in the Nelson-Motueka and Blenheim areas sowing is done from July to late December.

Sowing at a depth of 2 in. through every coulter of the grain drill is the most common method of the commercial grower. Seeding rates vary with the size of seed and range from as low as 2 bushels per acre for small-seeded peas to as much as 5½ bushels per acre for the larger garden varieties. The most common seeding rate for the more popular garden varieties would



[Green and Hahn

Some weeds in pea crops are best controlled with weedkillers. The illustration shows Californian thistle where a strip has been missed in the application of MCP.

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CULTIVATION OF PEA CROPS



A mobile pea viner harvesting green peas in Hawke's Bay for quick freeze.

be from $3\frac{1}{2}$ to 4 bushels per acre, and for field peas from $2\frac{1}{2}$ to 3 bushels per acre.

Sometimes cross drilling is carried out, when about 2 bushels of garden peas are drilled each way.

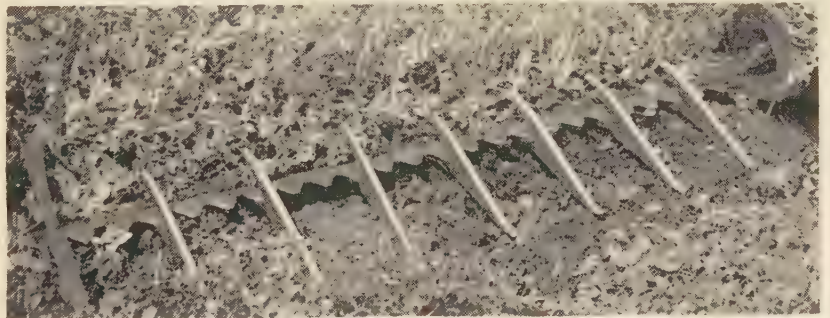
At drilling care should be taken that no seed damage occurs through the bruising or cracking of peas as they pass through the force feed of the drill, for germination can be easily affected by such damage. Large-seeded varieties are particularly susceptible to such damage and the use of special pea feeds in the drill is advisable for such seed.

Finely powdered graphite mixed with the seed at 2 oz per bushel assists in reducing seed damage during drilling and its use may be warranted in some circumstances.

Subsequent Cultivation

As cultivation for weed control in pea crops is possible only before the formation of tendrils, it is important to do everything possible to destroy weed growth early, and harrowing should be done both before and after the crop appears above ground level. One or two pre-emergence harrowings may be carried out, but care must be taken not to do this work when there is any chance of damaging the young shoots. After the young plants are

▼ The pea bar is a useful attachment to ease the cutting of pea crops for processing.



about 2 in. high two or three further harrowings may be given. After the final cultivation it may be necessary to roll the ground to make it suitable for harvesting operations.

In all this cultivation work the lightest tractor available and one with pneumatic tyres should be used. **Further, the work should be done at low speed.**

A recent addition to cultivating equipment for pea crops is an implement with self-driven revolving tines. This implement, **which is operated at high speed**, has given good results both in the control of weeds and in loosen-

ing the surface soil in pea crops. Weedicides may give good weed control, but a loose surface soil is often an important factor in the success of a pea crop. However, canning and quick-freeze varieties are more susceptible to damage by harrowing and with these varieties control of weeds by spraying is preferable.

Chemical Weed Control

The relatively recent development of efficient weed control sprays for use in pea crops has removed some of the uncertainty of pea growing. Two main classes of weedkiller used in peas are

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ROGOR

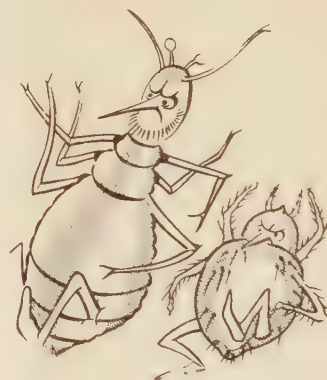
40

World wide trials have proved Rogor 40 a quick, safe, effective killer of damaging aphids, spider mites and thrips. It combines low toxicity to human beings with true systemic and persistent action against this wide range of pests of fruit and vegetables. Now you safely spray fruit and vegetables closer to harvest with Rogor 40—one of the most thoroughly tested chemicals from the human health safety angle. The sale of Rogor 40 is restricted to Commercial Growers only for use on

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Rogor 40 is a new Contact/Systemic Organo Phosphorus Insecticide for the control of aphids, spider mites, thrips, leaf hoppers, springtails, white flies, saw flies, scales and various leaf miners.

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HARVESTING OF PEA CROPS



Field peas and garden peas grown for seed are windrowed and threshed with a header harvester.

the phenol preparations known as DNBP and the more recently available MCPB. Generally DNBP controls a wider range of weeds than MCPB, but it does not control Californian thistle, so it is preferable to use MCPB for this weed. For peas to be processed DNBP is preferred because of the possibility of taint with MCPB.

Spraying of pea crops for weed control is now common, or practically standard, procedure, but the importance of the cultivation practices already described for the control of weeds and for the elimination of soil "crusting" must not be overlooked

Rogueing

Pea varieties are very susceptible to the development of "off-types", while admixture of foreign varieties by mechanical means is also a frequent source of contamination. To maintain the high standard of purity of seed peas required by export and local markets, merchants commonly employ gangs of trained men to go through their contract crops and remove these off-types and rogues. Special care is taken in the rogueing of the "stock" areas, and to facilitate this operation such crops are sometimes sown in 21 in. rows.

Harvesting

Seed Crops

For seed crops the time from sowing to seed harvest differs widely with variety, and soil and climate also have a marked influence, but the following



[Standish and Preere

Good samples can be obtained off the header. The sample on the right was obtained by passing the line (as shown by the sample at left) through the header again. An even better sample would be expected from machine dressing.

figures may serve as a general guide to harvest dates:

Greenfeast under reasonably early conditions in Canterbury can reach maturity in 19 to 20 weeks. In trials at Palmerston North maturity was reached in 17 weeks.

William Massey would be two or three weeks earlier than Greenfeast. Partridge and Blue Prussian reached maturity at Palmerston North in 18 to 19 weeks. In Canterbury this period would be extended to 21 weeks for fairly early conditions.

The above periods range from sowing to the ideal time for cutting peas

for threshing and not to the stage of being ripe for heading.

Good colour is desirable, especially in garden peas, and if seed is to be harvested with good colour, the crop should be cut when the top pods are just past their best for table use. When the crop is cut at this stage, however, it is necessary to leave it to mature for a week or longer before threshing. This introduces an element of risk, especially from wind, which not many farmers are now prepared to take. The common practice, therefore, is to allow the crop to become header ripe, when it is cut with the mower directly in front of the header



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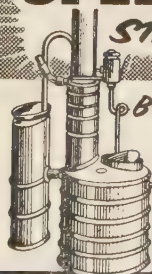
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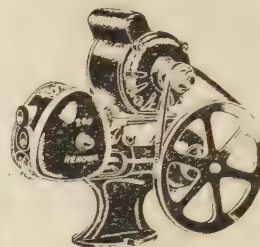
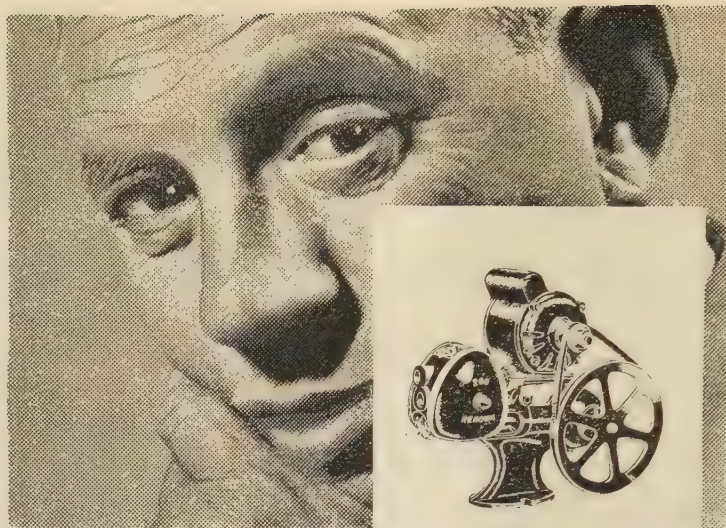
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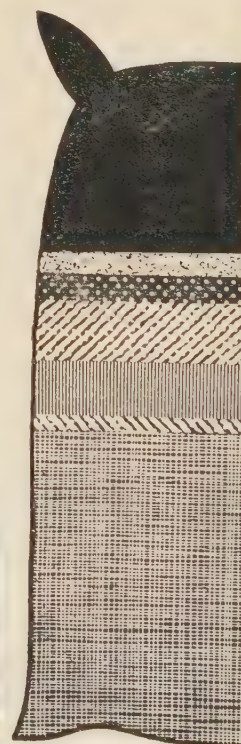
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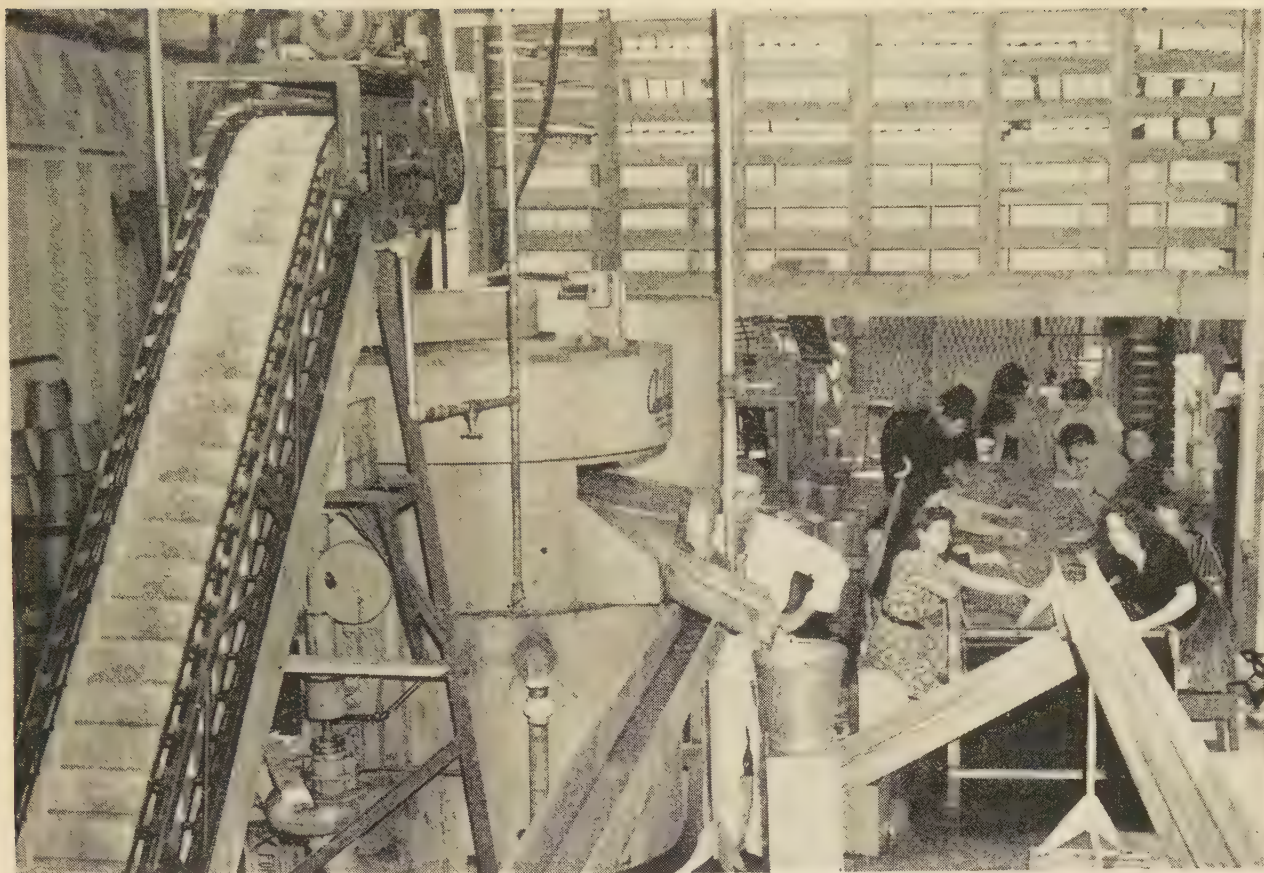
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PRODUCTION OF PEAS



[Sparrow

A section of a pea-canning factory. In 1957-58 about 11,000 acres of green peas were grown for the combined requirements of the canning and quick-freeze industries.

harvester. Such attachments as pea lifters and a "gooseneck" may be fitted if conditions warrant it. Pea rollers have lost favour in Canterbury, as their use increases the risk from wind.

The threshing of a crop in good condition is relatively simple if the header is efficiently handled. The first essential is a relatively fast drum speed, with the concave set fairly wide so that damage to the seed is reduced to a minimum.

Field peas such as Partridge and Blue Prussian are usually direct headed. To allow for conditioning of the seed after threshing, sacks should either be left in the paddock for a few days or placed on the grating of the woolshed.

Canning and Quick-freeze Peas

Two main methods are used in harvesting canning and quick-freeze peas. In the first the crop is cut with a mower, side-raked, and picked up by an elevator or green-crop loader on to a truck. It is then delivered to a stationary viner or vining plant which breaks open the pods and

removes the peas, leaving the trash, which is usually made into silage.

The second method is the use of the mobile viner, which is the main system used in the Hastings and Blenheim districts and is increasingly important in the Christchurch area. The crop is either cut with a mower on the tractor drawing the viner or pulled by the mobile viner as it proceeds. The vines are processed by the viner as it moves through the crop, the peas being extracted and the trash left on the paddock.

Silage made from the vines taken from the stationary viner or gathered after the passage of the mobile machine is a very useful by-product for the feeding of sheep and cattle.

Machine Dressing

Machine dressing is necessary for all peas intended for seed and is also very advisable for field peas for other uses (except grinding) if a high-quality product is to be marketed.

Seed of garden varieties is also sometimes hand picked while travelling on a slowly moving belt. This operation is expensive but useful for

special lines, as it permits the removal of shrivelled, discoloured, and foreign seeds. The development of new types of cleaning machines has reduced the necessity for hand picking to a minimum.

Yield

Canning and Quick-freeze Crops

Yields of canning and quick-freeze crops vary considerably, ranging up to 3 tons of green peas per acre, but an overall yield of 1½ tons per acre is average.

In addition an average yield of about 6 tons of silage may be expected.

Seed Crops

Dominion average yields of threshed peas usually range between 25 and 30 bushels per acre. Field peas tend to be somewhat more reliable with higher average yields than garden varieties, but top expectations are much the same for both types. Under ideal conditions yields of 80 bushels per acre are secured occasionally.

The trading bushel weight of peas is 60 lb.

(Continued at foot of page 70)

Gorse Control on Steep Country

STEEP country that had reverted to "old man" gorse is being brought back to good pasture on sheep farms by the use initially of fire and sheep rather than expensive sprays. In this way the number of gorse plants is reduced and those remaining are brought to a suitable condition for killing economically by spraying.

THE first step is to decide on the area that can be dealt with properly by the number of sheep available. This is important, because failure to graze really heavily in the first six to nine months can result in much heavier spraying costs later. Next, it is necessary to get a good, clean, hot burn over all the area to provide a good seedbed for regrassing and to allow the sheep to move freely over the area.

Spraying of the gorse before burning should not be necessary except in high-rainfall country or in shady places. If it is sprayed, the spray should be used only to get a better burn and the gorse must be cleared by burning, which reduces tremendously the live gorse seeds near the surface.

The area should be sown with a good grass and clover mixture with plenty of short-rotation and perennial ryegrass (to give quick growth) and, of course, red and white clover. Adequate topdressing is essential.

Cleaning up Seedlings and Regrowth

Then comes the most important step, the use of sheep to clean up seedling

gorse and to keep right on top of the basal regrowths from the old roots. If regrowth can be controlled, many of the old roots will die. Then in the second summer after the first burn any seedlings which the sheep have missed or old plants re-established by regrowths can be cleaned up by spot spraying with 2,4,5-T. Such spraying will not be costly and should be effective because both the seedlings and regrowths will be at the right stage for treatment.

As soon as there is sufficient feed on the young pasture the sheep must be crammed on until all growth is bared down to the ground, then taken off for a spell, and brought back again to repeat the treatment. If there has been a good strike of the pasture seed, the seedling gorse problem will be finished when spring growth comes away, though gorse regrowths will continue to be made well into summer and periodic really severe grazing with large mobs of sheep will be required to eliminate them. Eventually a lot of the old roots will die.

Efficient use of sheep is most important in reducing the cost of spraying. The gorse will not be eliminated, because seedlings will continue to

become established and for many years spot spraying or grubbing will be required to prevent the area again reverting to gorse.

—C. J. HAMBLYN,
formerly Fields Superintendent,
Department of Agriculture,
Palmerston North



Pea Production

(Continued from page 69)

Diseases

Several diseases which attack the pea crop are:

Damping off is caused by various fungi in the soil which cause rotting of the seedling. It is a serious disease in some seasons when conditions are wet immediately after sowing. Seed treatment as discussed earlier gives good control.

Collar rot, also a common disease, is caused by a fungus and, like damping off, is most prevalent in wet seasons. Brown to dark-purple lesions are formed on the stems and spots appear on the leaves. The lesions on the stems occur particularly about ground level. Infected plants become severely stunted and may die off.

The disease is both seed and soil borne. Some control is secured by

seed treatment, but on infected land crop rotation is necessary.

Infected seeds are usually slightly discoloured, and much infection may therefore be avoided by the hand picking of seed, but the extent of infection in the crop depends mainly on the season.

Mildews: Two types of mildew affecting peas are downy mildew and powdery mildew. The former is a grey, fluffy down on the under-surfaces of leaves and the latter is a white, floury growth on leaf surfaces. They are not usually of much economic importance.

Mosaic is an important disease in Marlborough. It is caused by a virus and the only method of control is by the use of resistant varieties such as William Massey and Onward. Greenfeast is susceptible. The prevalence of mosaic in Marlborough is due to the wide use in that district of red clover, on which the virus overwinters.

Wilt, caused by a fungus, can be serious in the pea crop, for its effects are severe and infection remains practically indefinitely in the soil, though satisfactory crops can usually be obtained after six years or more without peas. Affected patches in a crop turn a pale, yellowish green and rapidly die. Some infected plants may reach the flowering stage, but few set seed.

The main defence against this disease is in the use of resistant varieties. Most of the canning and quick-freeze varieties are resistant. The garden varieties Greenfeast, William Massey, and Onward are susceptible, but the Crop Research Division has now bred and released a resistant strain of Greenfeast, and resistant strains of Onward and William Massey will shortly be available.

Horticultural Research

Brussels Sprouts Trial at Levin

By A. B. WEBSTER,
Scientific Officer,
Department of Agriculture's
Horticultural Research Station,
Levin

NINE varieties of Brussels sprouts were grown in a trial recently completed at the Horticultural Research Station, Levin, to compare the performance of new varieties with standard commercial varieties.

THOUGH Levin is not a recognised sprout-growing district, conduct of the trial at the Station enabled all varieties to be grown under strictly comparable conditions, under close observation, and under climatic conditions typical of most vegetable-growing areas in the North Island. All varieties produced a satisfactory crop, though the quality of the early sprouts was rather poor.

The commercial varieties in the trial were Katskill, of American origin, and Cambridge No. 5 and Fillbasket from Britain. The new varieties included five Irish Elegance strains bred by Professor G. O. Sherrard, of Dublin, who has made sprouts breeding his life's work, and the first F_1 hybrid Brussels sprout, Jade Cross, by Takii and Co., Ltd., Kyoto, Japan.

Seed was sown in rows 12 in. apart on 15 October 1958, and seedlings planted out 3 ft square on 8 December.

Fowl manure at 30 tons per acre had been ploughed into the rather impoverished soil and 3 tons per acre of ground limestone were applied to bring the pH up to 6.2.

The following fertiliser mixture at 20 cwt per acre was worked into the soil just before planting:

Blood and bone 35 parts

Dried blood 10 parts

Superphosphate 28 parts

Sulphate of ammonia 10 parts

Sulphate of potash 15 parts

Trace elements applied at the same time were:

Sodium molybdate 2 oz per acre

Borax 20 lb per acre

Magnesium sulphate 3 cwt per acre



▲ Jade Cross, the earliest and heaviest yielding Brussels sprout in the trial.

As a precaution against damage by cutworms and other soil pests DDT at 2 lb of active ingredient per acre was worked into the soil just before planting.

Growth was very rapid in the early stages and a good stand was obtained. Insect pests and fungous and bacterial diseases were kept under control by regular spraying.

Results

Jade Cross was the first variety to be picked. It was picked twice—on 12 February and 3 March—before picking started on the other varieties on 13 March. Harvesting was finished on 20 July, there having been seven picks for all varieties except Jade Cross, which had nine.

The table shows total yields and yield of salable sprouts.

The size and quality of the sprouts varied considerably. In the early part of the season they were large and quality was poor. Many sprouts bolted or became so elongated as to be unsalable. Later in the season the sprouts became smaller and much

firmer. Over the whole crop Irish Elegance and Jade Cross had the smallest sprouts and Katskill the largest, while Cambridge No. 5 was less firm than the other varieties, all of which were equally firm.

Cooking quality, too, varied with the season. In March the flavour was rather strong. Even after cooking for twice the normal time the sprouts were still hard and unpalatable. Later on in May and June the flavour and texture improved and left nothing to be desired.

The presence of Brussels sprouts on the market floor in early March met with a mixed reception. To most retailers they were out of season, unsalable, and of no interest. To an enterprising minority they were a novelty; a new vegetable for those surfeited with peas and beans; salable in small quantities. They sold for 1s. 11d. per lb at the market.

Varietal Results

Notes on each variety in the trial, listed in order of merit, are as follows:

Jade Cross: A very uniform stock. Sprouts small and firm, but with loose leaves at base; stems straight and upright; 37 in. tall. Difficult to pick because the sprouts are so tightly packed on the stem. The heaviest yielder in the trial with a low proportion of unsalable sprouts.

Katskill: A rather uneven stock. Sprouts large and firm; stems 39 in. tall and inclined to be crooked; leaves large and roughly crinkled. A heavy yielder, but gives a high proportion of unsalable sprouts; fairly easy to pick.

YIELD OF BRUSSELS SPROUTS
(Tons per acre)

Variety	Salable yield	Total yield
Jade Cross	7.82 a*	9.22 a
Katskill	5.96 b	8.08 b
Irish Elegance 43/58 ..	5.72 bc	7.30 bc
Irish Elegance 1/57 ..	4.99 cd	6.30 cd
Fillbasket	4.81 d	6.58 cd
Irish Elegance 7/52 ..	3.62 e	4.87 ef
Irish Elegance 46/52 ..	3.56 e	4.70 ef
Irish Elegance 40/58 ..	3.52 e	4.38 f
Cambridge No. 5 ..	2.95 e	5.65 de

* Any two varieties are similar if they have any letter in common. If this is not so, they differ significantly ($P = 0.05$).

BRUSSELS SPROUTS TRIAL AT LEVIN . . .

Irish Elegance 43/58: A reasonably uniform stock. Stems 42 in. tall; straight and upright. Sprouts large, firm, and fairly easy to pick. A heavy yielder with a moderate amount of unsalable sprouts.

Irish Elegance 46/52: Apart from one or two odd plants, a very uniform stock. Stems 45 in. tall; strong and upright. Sprouts very small and very firm; easy to pick. The best-quality sprout in the trial, though its yield was among the lowest.

Irish Elegance 40/58: A fairly uniform stock. Stems 46 in. tall; straight. Leaves very spreading. Sprouts slightly larger than 46/52, but just as firm. Fairly easy to pick. A low-yielding strain of good quality and little waste.

Irish Elegance 1/57: A fairly uniform stock. Stems 44 in. tall; some of them crooked and bent. Sprouts fairly large and very firm. A fairly heavy cropper.

Irish Elegance 7/52: A very mixed stock. Stems 39 in. tall on average, but variable. Sprouts fairly small and very firm. A moderate cropper.

Fillbasket: A rather uneven stock. Stems 41 in. tall; a few stems crooked. Habit spreading because of its long leaves. Sprouts large and firm. A moderate cropper.

Cambridge No. 5: An even, uniform stock. Stems 40 in. tall and mostly upright. Sprouts fairly large and rather soft. The total yield

was fairly heavy, but there were so many unsalable sprouts that it gave the lowest yield of salable sprouts.

Discussion

The yields obtained compare very favourably with those obtained in other districts and other parts of the world, but the proportion of unsalable sprouts was high, possibly because of

1. The variety being grown.
2. The early sowing and planting date.
3. The high nitrogen content of the fertilisers and manures.
4. Mild, warm conditions for the greater part of the growing season.

The first factor can be overcome by growing a variety which produces only a few unsalable sprouts.

Sowing and planting later would make the sprouts mature later when it is cooler. This should improve the quality and reduce the proportion of

unsalable sprouts, but it would also reduce the total crop. Further experiments should be done to determine the optimum planting date. The quality of the sprouts would probably have been improved if only a little nitrogen had been given in the base dressing and the balance applied later as top-dressings when the plants were established.

Conclusions

1. **Jade Cross** was the best all-round variety in the trial, despite its being hard to pick.
2. Other heavy-yielding varieties of merit were **Katskill** and **Irish Elegance 43/58**.
3. The best-quality sprouts were **Irish Elegance** strains **46/52** and **40/58**.

Acknowledgment

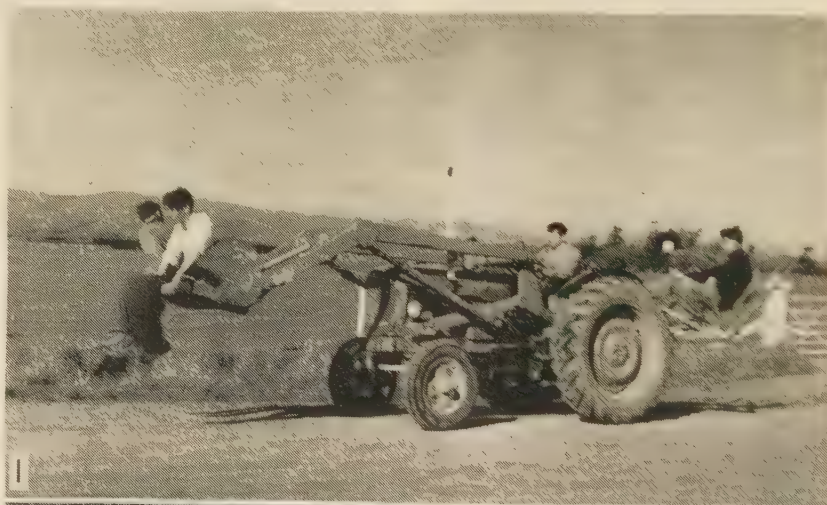
The trial was laid out and managed by D. A. Stadel, now Horticultural Advisory Officer, Auckland, until 3 March 1959.

Risks that Contribute to Tractor Fatalities

TRACTOR operators are bound to be involved in fatal accidents as long as these risks are taken. The examples of dangerous practices are reconstructions of actual cases reported by a Hawke's Bay "Journal" reader who was shocked by the irresponsibility revealed.

1 Most standard farm tractors are not designed to carry passengers; they should certainly never be allowed on attached implements. Most people would find it hard to credit that irresponsibility would go as far as in the example illustrated, but a tractor with implements and passengers as shown was seen on a Hawke's Bay highway.

2 Children simply must not be allowed to ride on tractors. The risks are accentuated here because the driver's attention is divided between control of the tractor and watching the cows. Under these circumstances he may easily forget that a young child is unlikely to be able to maintain balance should a sudden alteration in speed or direction be made.



[R. D. Blackmore photos]

Well Housed Dogs are:

By A. D. M. G. LAING,
Chief Advisory Officer (Hydatid Control), Department of Agriculture,
Wellington

DOGS do not need to be pampered, but they should have absolutely dry quarters free from draughts. Kennels or dog houses should be on dry, well drained sites. Shade of some sort may have to be provided where the site becomes very warm in summer. A well constructed, dry kennel with a small concrete yard covered with removable timber sections is best. The floor should be slightly sloped so that it can be cleaned down easily. Some examples of good accommodation for dogs are shown in the accompanying illustrations. Not only does such housing assist in keeping animals in top working condition and free of many ills, but it is an essential step in eradication of hydatids.

- **Fitter for work**
- **Healthier**
- **Less likely to spread hydatids**



CONSTRUCTION DETAILS

The concrete floor is 3 in. thick with a lip of 3 in. The slab on which the kennels rest is 10½ in. above the level of the yard. To facilitate washing down there is a fall of 1 in 25 each way toward the opening in the lip (shown in the upper illustration), where a sump is to be provided. Each yard is 6 ft long and 2 ft 6 in. wide with a door in front the full width of the partition. The whole unit is of 2½ in. wire mesh netting over a framework of galvanised piping. It is easily removed as shown at right.

The kennels simply fit into the back of the yard unit. Their external dimensions are: Length, 3 ft 2½ in.; width, 2 ft 2½ in.; height, 2 ft 5 in. They are made of weatherboarding with flat iron roofs slightly pitched over a ridge board. The roof overhang (5 in.) projects into the yard unit.

It is intended to place removable wooden floorings on the concrete yards.

These yards, which can be cleaned very easily and efficiently, cost £29 5s. for materials.



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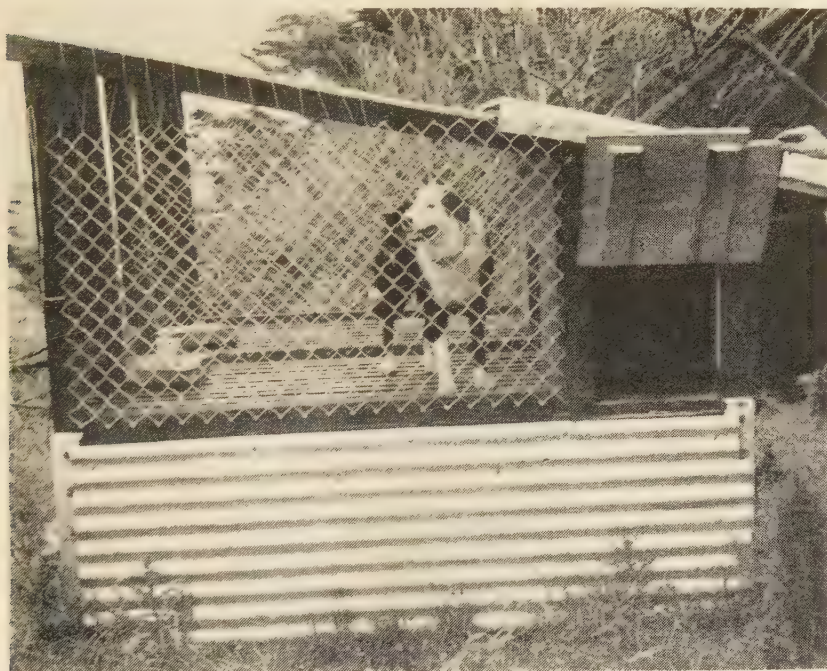
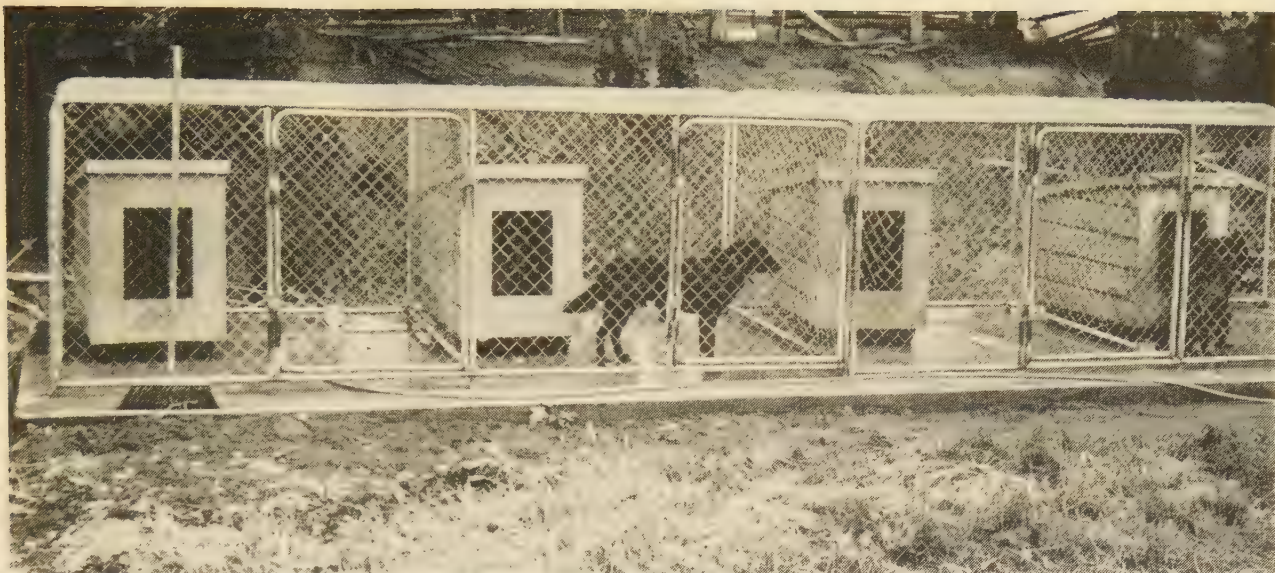
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CONSTRUCTION DETAILS

The main feature of this dog house is that it is set above the ground and the corrugated iron surround is removable at the back to allow the ground beneath the floor to be cleaned out.

The yard portion is made of ordinary framing timber and wire mesh netting with a floor of 2 in. x 2 in. chamfered wooden battens. The floor is 2 ft above the ground.

The floor projects 6 in. out from the front of the house so that the food dishes can be drawn out easily with

the wire hook shown hanging on the stud at extreme left.

The kennel was made of 6 in. x 1 in. weatherboarding and there is a space of 1½ in. between the kennel floor and the floor of the run. The kennel area is 3 ft 6 in. x 2 ft.

The yard is 4 ft high in front and 3 ft at the back, with an area of 3 ft x 3 ft 6 in.

The houses shown are on the properties of Mr A. F. Fetch, Masterton (p. 73), Mr R. S. McCully, Orton (upper above), and Mr J. M. Satterthwaite, Claremont (lower above).

CONSTRUCTION DETAILS

The floors are of concrete. The individual enclosures are 6 ft square.

The 2 in. wire mesh netting walls are 4 ft high and removable if necessary for cleaning.

The kennels are 3 ft long, 2 ft wide, and 2 ft 9 in. high at the front and 2 ft high at the back. They are on wooden runners, so that they can be moved easily for cleaning, and were made of weatherboarding.

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5. A sack or old piece of linoleum in the kennel for the dog to lie on. The kennel floor should be a few inches off the ground.
6. A water supply laid on to the kennel so that drinking water is always readily available. A dog which is thirsty when released and therefore rushes off to the nearest water for a long drink will not be in good condition for work.
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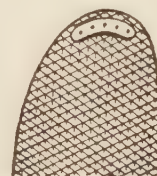
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Recent Research Work



SPRAY IRRIGATION

OVER the past 11 years a series of experiments designed to study various aspects of spray irrigation of pastures has been in progress at Rukuhia Soil Research Station. Various aspects have been reported on from time to time. Incidental to this work certain data have been obtained which it is believed may be of interest to those who use, or contemplate using, spray irrigation.

THOUGH trials have been in progress for 11 years, no one trial has run for the entire period. However, by extracting the appropriate information from various trials in which a comparison of irrigated and non-irrigated pasture occurs, it has been possible to determine the extent of the response to irrigation in each season between 1948-49 and 1958-59.

A summary of this information is presented in Table 1. The data chosen are from experiments on Hamilton clay loam. Up to 1952-53 the swards were under sheep grazing and subsequently under cattle grazing.

TABLE 1—YIELD FROM IRRIGATED AND NON-IRRIGATED PASTURES FOR PERIOD 1948-49 TO 1958-59

Year	Total annual production			*Summer production		
	Irrigated	Non-irrigated	Per cent increase	Irrigated	Non-irrigated	Per cent increase
	lb dry matter per acre	lb dry matter per acre		lb dry matter per acre	lb dry matter per acre	
1948-49 ..	15,460	11,540	31	7,080	3,610	96
1949-50 ..	13,550	10,710	27	5,570	2,900	92
1950-51 ..	10,490	8,140	29	4,210	2,160	95
1951-52 ..	11,600	9,240	26	5,440	3,470	57
1952-53 ..	13,360	10,920	22	6,230	3,370	85
1953-54 ..	14,880	8,250	80	7,220	1,070	575
1954-55 ..	15,520	7,810	99	6,480	2,120	206
1955-56 ..	14,570	9,630	51	6,950	1,810	281
1956-57 ..	14,490	12,330	18	7,120	4,150	72
1957-58 ..	15,040	12,620	19	6,420	4,670	37
1958-59 ..	16,100	12,740	26	6,910	5,060	37
Average ..	14,190	10,360	36	6,330	3,130	102

* December-March inclusive

Total production: Features of the results given in Table 1 are:

1. The average increase due to irrigation over the 11 years was 36 per cent.
2. Important responses were obtained in all years.
3. In three years spectacular increases (over 50 per cent) were obtained.

Summer production: Data relating to this period show more clearly the potential value of irrigation. It will be seen that:

1. The average increase due to irrigation was about 100 per cent.
2. In three seasons the yield was more than trebled.

IRRIGATION SEASON IN WAIKATO

From a knowledge of climatological data it should be possible to calculate with reasonable accuracy the loss of moisture from an area under pasture. Using these data in conjunction with rainfall records, it is possible also to determine the net amount of moisture that has been lost from the soil at any particular time. This net loss is called the moisture deficit.

Furthermore, it has been established from experiments conducted at the Rukuhia Soil Research Station that for optimum growth of pasture water should be applied when the moisture deficit reaches 1 to 1½ in. The figure will vary with soil type, but is likely to be within the range mentioned.

Calculations to determine the number of irrigations have been made covering 10 years both on the basis of irrigating at a 1 in. and at a 1½ in. deficit. The information is summarised in Table 2.

TABLE 2—NUMBER OF IRRIGATIONS

Year	Irrigation at 1 in. deficit		No. of irrigations	Water applied
	Date of first irrigation as determined by the deficit calculation	Date of last irrigation as determined by the deficit calculation		
1949-50 ..	8/9/49	30/3/50	14	14
1950-51 ..	23/9/50	19/3/51	13	13
1951-52 ..	16/9/51	6/4/52	9	9
1952-53 ..	25/12/52	16/3/53	6	6
1953-54 ..	19/11/53	19/3/54	12	12
1954-55 ..	29/9/54	28/3/55	15	15
1955-56 ..	7/11/55	23/3/56	13	13
1956-57 ..	21/11/56	4/3/57	12	12
1957-58 ..	6/11/57	8/4/58	14	14
1958-59 ..	1/10/58	28/3/59	13	13

Irrigation at 1½ in. deficit

Year	Irrigation at 1½ in. deficit		No. of irrigations	Water applied
	Date of first irrigation as determined by the deficit calculation	Date of last irrigation as determined by the deficit calculation		
1949-50 ..	24/11/49	31/3/50	8	12
1950-51 ..	27/11/50	31/3/51	8	12
1951-52 ..	2/1/52	9/4/52	6	9
1952-53 ..	27/12/52	10/3/53	3	4.5
1953-54 ..	27/11/53	3/4/54	8	12
1954-55 ..	28/10/54	28/3/55	9	13.5
1955-56 ..	15/11/55	16/3/56	8	12
1956-57 ..	10/12/56	4/3/57	7	10.5
1957-58 ..	30/11/57	11/4/58	8	12
1958-59 ..	5/10/58	11/2/59	6	9

A sound irrigation schedule will provide for the application of water when the deficit is between 1 and 1½ in. From Table 2 it will be seen that irrigation is seldom necessary before November. On the other hand, it can very seldom be delayed until after Christmas. Since it is important to begin irrigating early, the position should be watched from October onward. Watering should be started if there is a period of seven or eight days without rain and none is forecast. The final application will normally be in March.

—H. G. HOPEWELL, Senior Scientific Officer,
Rukuhia Soil Research Station

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Argentine Stem Weevil Damage to Ryegrasses in the North Island

By J. M. HOY,

Entomology Division, Department of Scientific and Industrial Research,
Palmerston North

OVER the last five years the Argentine stem weevil has been responsible for severe damage to ryegrasses, particularly short-rotation and Italian, in Canterbury. In the 1957-58 season the stem weevil was suspected of damaging a few stands of short-rotation ryegrass in the North Island. In the latter part of the 1958-59 season there were numerous reports of slight to severe damage to ryegrass pastures in the North Island. This article reports surveys of damage and discusses control methods.

THE Argentine stem weevil was first found in New Zealand in 1927. It is now known to be widely distributed throughout both main islands. The stem weevil was first recorded as a pest of wheat in Canterbury in 1933, but before that damage caused by the weevil may have been confused with that caused by Hessian fly. Though until recently Argentine stem weevil has been considered a pest of wheat and barley, the insect has a wide range of food plants including the majority of the sown grasses.

Description and Life History

The adult insect, which has a typical weevil snout, is about $\frac{1}{2}$ in. long and is light to dark grey. The basic colour of the body varies from medium to dark brown, but this colour is overlaid by white, wax-like scales varying in density. These scales are responsible for the greyish appearance. Eggs are minute, bean shaped, and brownish black. The larva is legless and light cream with a dark brown head capsule. When fully grown it rarely exceeds $\frac{1}{4}$ in. long. The pupa ranges in colour from cream to light brown before the emergence of the adult insect.

The life history of Argentine stem weevil has not been studied in the North Island, the following account being based on work carried out in Canterbury by J. M. Kelsey, Entomology Division, Department of Scientific and Industrial Research. The statements may require modification when the insect's behaviour under North Island conditions is known.

Though adults are found in any month of the year, there are apparently two clear-cut generations. The

weevil overwinters as an adult which feeds to a limited extent on warm, sunny days. Eggs are laid from the beginning of September to early November, first-generation larvae being present from early October until mid December. Second-generation adults are found from early December until the end of February. Eggs laid by these adults are present from mid December until the end of March. Second-generation larvae occur from mid January until the end of April. By mid May only overwintering adults are present.

Adults are active both by day and night, but feed mainly at night. Weevils are capable of flight and this is probably the chief means of dispersion. Eggs are laid in a pocket in the back of the leaf sheath at a point where the sheath adheres closely to the tiller. Usually two eggs are laid at a time.

After hatching, larvae tunnel downward in the leaf sheaths. When plants are in vegetative growth, larvae almost always tunnel into the tillers and continue to feed downward toward the crowns. Tillers infested in this way are usually killed. When plants are making reproductive growth larvae may enter the stems near any node from the second to seventh from the crown. Such an attack leads to premature ripening and the condition known as "white head". Fully fed larvae cut holes in the sides of the tillers or straw and drop to the ground before pupating. Pupae are usually found in the top $\frac{1}{4}$ in. of soil.

Argentine stem weevil is responsible for three types of damage:

1. Adults feed on the foliage of a variety of plants, including most grasses, cereals, clovers, lucerne, and



Distribution of Argentine stem weevil damage in North Island in 1959.

crucifers. Adult feeding causes a silvering of the foliage rather similar to slug damage. Such feeding is not usually serious in pastures unless followed by larval damage.

2. Larval feeding while plants are in reproductive growth can result in up to 7 per cent of "white head", but this type of injury does not usually have a serious effect on seed yields.

3. The most serious damage to ryegrasses follows larval feeding in tillers. This damage occurs while plants are making vegetative growth before seeding and again on the return to vegetative growth after seeding. It is possible to confuse this sort of damage with that caused by grass grub, but where Argentine stem weevil is responsible the root system of the plant is still intact. Eggs are laid in and larvae develop in most grasses, but particularly in short-rotation, Italian, and perennial ryegrasses and in wheat, oats, and barley. Larvae feed to a limited extent in the petioles of young rape plants.

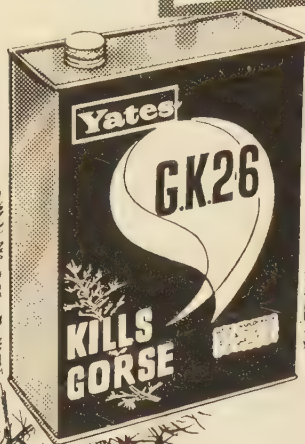
Pasture Damage in North Island

A survey was made during the 1958-59 season to obtain a preliminary assessment of the extent and severity of damage to ryegrasses in the North Island. This survey was made possible by the cooperation of Department of Agriculture and Dairy Board officers throughout the island. Areas where Argentine stem weevil damage was reported are shown on the accompanying map.

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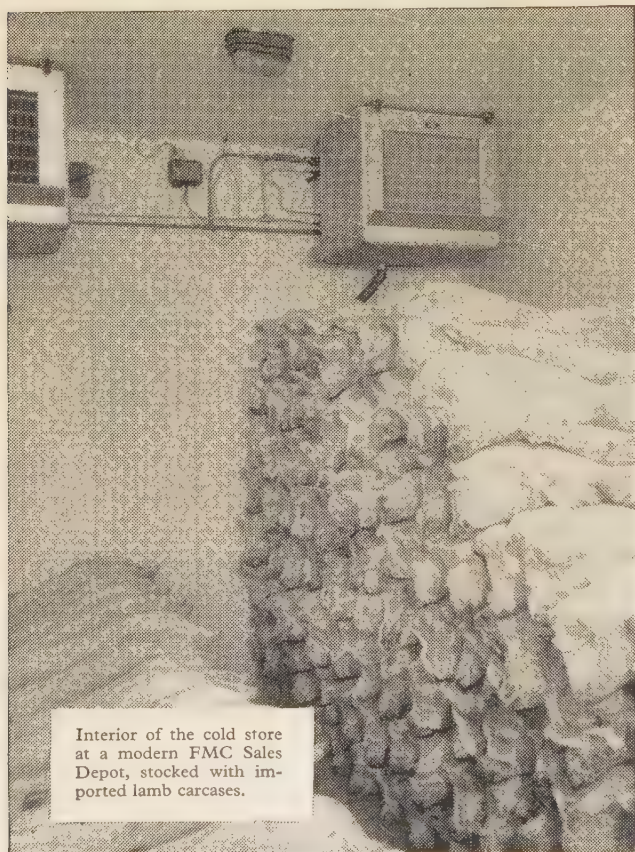
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In North Auckland damage was reported from one farm near Waipu. In the South Auckland area light damage occurred near Tauranga and Tokoroa and more widespread but light damage in the Te Awamutu district. Near Taumarunui two areas totalling 50 acres were badly damaged. In northern and central Taranaki damage was widespread but generally light. More serious damage occurred in southern Taranaki, where at least 200 acres of pasture was severely affected and a further 250 acres showed patchy damage. In the Wanganui district damage was reported on one farm. In Manawatu a number of experimental pure short-rotation ryegrass pastures were severely damaged. In the Levin-Otaki area up to 50 per cent loss of short-rotation ryegrass was reported in newly sown pasture.

The survey showed that short-rotation and Italian ryegrasses were more seriously affected than perennial ryegrass. This difference had already been noted in Canterbury by Kelsey. Both short-rotation and Italian ryegrass appear to be more susceptible to attack and these grasses lack the capacity to recover when the majority of the tillers are killed.

Complete loss of pasture occurred only in pure stands of short-rotation ryegrass. Young pastures, particularly those sown in the spring of 1958, were more seriously damaged than older pastures. The degree of damage did not appear to be related to the previous history of a paddock; some pastures had been sown after cruciferous crops and some after grass with or without an intervening fallow.

Very little is known of the ecology of this insect, but the observation has been made in the Argentine that large numbers of weevils and severe damage to wheat occur in areas of low winter rainfall. This may be the reason for

control may be worked out, no firm recommendations can be made yet. There seems little hope of controlling the larvae once they have entered the plant, so that control by insecticides will probably be restricted to the adult insects.

As adult weevils rarely penetrate the soil to a depth greater than $\frac{1}{4}$ in., insecticides applied to the soil will normally be quickly carried to depths at which they would be ineffective. Present indications are that insecticides will have to be applied at least twice a year, the applications being timed to coincide with adult activity before egg laying. Both DDT and lindane show some promise in preliminary trials.

Crop rotation does not appear to offer any hope in reducing weevil damage, as adults feed on a wide variety of plants. Perhaps the best prospect lies in the development of strains of ryegrass capable of withstanding weevil damage but retaining the desirable agronomic characters of short-rotation ryegrass.

Under North Island conditions the amount of damage caused by Argentine stem weevil is likely to vary from season to season. Management, soil fertility, and seasonal conditions are particularly important with short-rotation ryegrass. It would be unwise to blame the stem weevil for all cases of lack of persistence in this grass.

World Census of Agriculture

MORE than 80,000 schedules requesting farm production statistics will be sent out at the end of this month, says the Government Statistician. The value of this census depends largely on the time taken to publish final figures. **Would you please assist by completing and returning your schedule as promptly as possible.**

heavier and more consistent damage in Canterbury with its low winter rainfall than in the North Island.

Control

Experience in the use of insecticides to control Argentine stem weevil is, as yet, very limited. Though an effective

A. and P. Show Dates

THE following are dates and venues of A. and P. shows up to the end of April:

NORTH ISLAND

January

- 22 and 23 January—Feilding at Feilding.
- *22 and 23 January—Wairoa County at Wairoa.
- 29 and 30 January—Horowhenua at Levin.
- *30 January—North Kaipara at Paparua.

February

- 3 February—Marton District at Marton.
- 4 February—Te Kauwhata at Te Kauwhata.
- *5 and 6 February—Rodney at Warkworth.
- 6 February—Woodville at Woodville.
- 6 February—Rangitikei at Taihape.
- 9 and 10 February—Dannevirke at Dannevirke.
- 10 February—Te Awamutu at Te Awamutu.
- 12 and 13 February—Taranaki at New Plymouth.
- 12 and 13 February—Taumarunui District at Taumarunui.
- 13 February—Tauranga at Tauranga.
- 13 February—Pahiatua at Pahiatua.
- *13 February—Hukerenui at Hukerenui.
- 13 February—Waiau at Ruatoria.
- 16 February—Otorohanga at Otorohanga.
- 18 February—Matamata at Matamata.

- 19 and 20 February—Ohura at Nihoniho.
- 19 and 20 February—Franklin at Pukekohe.
- 19 and 20 February—Masterton at Masterton.
- 20 February—Te Puke at Te Puke.
- 24 February—Morrinsville at Morrinsville.
- 26 and 27 February—Te Kuiti and District at Te Kuiti.
- 26 and 27 February—Wellington and Hutt Valley at Trentham.
- 27 February—Mangonui County at Kaitia.
- *27 February—Putaruru District (Jubilee Show) at Putaruru.
- 27 February—Northern Wairoa at Arapohue.
- 27 February—Waimarino at Raetihi.
- 27 February—Whakatane at Whakatane.

March

- 5 March—Albany at Albany.
- 5 March—Opotiki at Opotiki.
- *12 March—Kumeu District at Kumeu.
- *19 March—Wellsford at Wellsford.

SOUTH ISLAND

January

- 16 January—Waikouaiti at Waikouaiti.
- 16 January—Wallace at Otatau.
- 23 January—Golden Bay at Takaka.

- 23 January—Palmerston and Waihemo at Palmerston.
- 23 January—Peninsula at Duvauchelle.
- 23 January—Waiau at Tuatapere.
- 26 and 27 January—Otago at Dunedin.
- 30 January—Banks Peninsula at Little River.

February

- 13 February—Inangahua at Reefton.
- 20 February—Maniototo at Ranfurly.
- *20 February—Murchison at Murchison.
- 27 February—Central Otago at Omakau.
- 27 February—Kaikoura at Kaikoura.

March

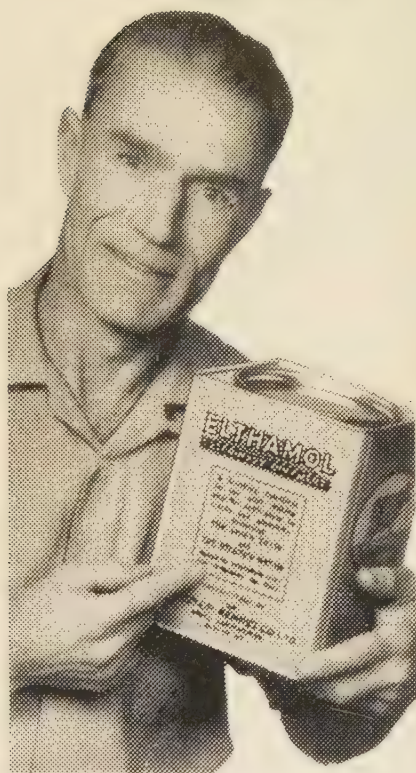
- 5 March—Amuri at Rotherham.
- 5 March—Temuka and Geraldine at Winchester.
- 12 March—Mayfield at Mayfield.
- 12 March—Cheviot at Cheviot.
- 12 March—Mt. Benger at Roxburgh.
- 19 March—Upper Clutha at Wanaka.
- 19 March—Methven at Methven.
- 19 March—Hawarden at Hawarden.

April

- *2 April—Oxford at Oxford.
- 9 April—Malvern at Sheffield.
- 18 April—Strath Taieri at Middlemarch.
- *18 April—Mackenzie County at Fairlie.

* The Department of Agriculture exhibit will be staged at this show.

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Virus Disease Effectively Controls White Butterfly

By D. H. TODD,
Entomology Division,
Department of Scientific and
Industrial Research,
Palmerston North

RECENT surveys by the Entomology Division, Department of Scientific and Industrial Research, Palmerston North, in the main brassica growing areas in the North Island produced conclusive evidence that the white butterfly is effectively checked each season by a virus disease, and to some extent by an introduced parasite. This article stresses the importance of the virus disease as a controlling agent of the white butterfly, and advises farmers, particularly in the North Island, to consider this factor before employing insecticides to control the pest.

THE white butterfly, *Pieris rapae* is one of the most common and conspicuous pests of brassica crops (chou moellier, rape, turnips, and swedes) in New Zealand. It has been in the country for about 30 years, and many farmers now use insecticides to control it.

During the 1955-58 seasons a series of field surveys was conducted to ascertain the incidence and parasitism of insect pests of brassica crops in the main brassica growing areas in the North Island. In all, 155 individual crops, mainly those grown for winter fodder, were closely examined. Crops in Hawke's Bay, Wairarapa, and Manawatu were examined during the summer of 1955-56, and for the 1956-58 seasons the survey was extended to the Rangitikei and Taranaki districts as well. The results of the surveys showed that in spite of the relatively large numbers of white butterflies seen at times over brassica crops in some districts, caterpillar populations were generally low and crop damage slight and mainly confined to the margins.

Assessing Crop Damage

The degree of damage occurring in a crop can be determined only by

examination and not by the magnitude of the adult population flying over it. Nor do large numbers of butterflies over a crop necessarily indicate impending danger. Each season, due to white butterfly, many farmers feel concern for the survival of their crops, particularly those grown for winter fodder.

It is considered, however, that the concern is not always on account of visible damage to the crop, but is due mainly to the farmer's observance of the substantial increase in the number of adult butterflies over it. This generally occurs about February. The increase is the result of a steady build up of the pest during the preceding months, and as the adult is a conspicuous object, many farmers naturally become disturbed when they observe this build up taking place.

Symptoms of Infection

The virus attacks only the caterpillar stages of the white butterfly, the smallest to the largest being equally affected. Healthy caterpillars are active, intense green, with a soft velvety appearance. In the early stages of infection they become inactive, flaccid, whitish, and cease to

feed. Soon after this there is a distinct swelling of the infected specimens, resulting in the body segments showing up more prominently. It is generally during this stage of the infection that the diseased caterpillars die.

During the more advanced stages of infection most of the dead caterpillars rupture, allowing the body contents to escape. After this occurs the diseased specimens become black and ultimately appear as "black smudges" on the foliage before they are washed off by rain.

Normally about February a large proportion of the existing white butterfly caterpillars are virus infected. Any subsequent build up of the pest at this stage would create crowded conditions which are known to be extremely favourable for the rapid development and spread of the virus. Farmers can therefore be assured that most of the progeny resulting from the relatively large numbers of butterflies seen over their crops in February and March will be killed by the virus. Damage is not likely to occur from this time onward, and generally, where crop damage has already been experienced, favourable growth conditions in the autumn will ensure full recovery of the damaged plants before the winter.

Even at the very onset of the season, virus infected caterpillars can be found on the crops, but rarely is there a build up of the organism until there is a substantial increase in the caterpillar population. Generally, of course,



Progressive stages in the development of virus in its attack on caterpillars of white butterfly, ending in a "black smudge" on leaf at right. Healthy caterpillar at far left.

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this does not occur until the latter part of the season. However, where crops are carrying fairly large numbers of caterpillars relatively early in the season, the correspondingly early development of virus in these caterpillars prevents excessive crop damage.

Factors Influencing Spread of Virus

Apparently there is a definite relationship between the rapidity of spread of the virus and weather conditions. In early autumn, when caterpillar populations are generally at their highest, warm showers and morning dews occur. It is probable that the physical effects, particularly of rain, play an important part in spreading virus infection within crops. As healthy caterpillars probably acquire the disease both by contact with infected specimens and by eating contaminated food, moisture of any kind would tend to spread contamination on individual plants. Consequently this would accelerate the rate of spread and degree of infection throughout the whole crop.

Insects and birds are also considered to be responsible to some degree for spreading the disease, not only within a crop, but also from one crop to another. J. M. Kelsey, Entomology Division, Department of Scientific and Industrial Research, reached similar conclusions after inspecting crops throughout Canterbury from early February to early April 1957.

Unnecessary Use of Insecticides

During the three seasons' investigations in the North Island it has been possible to examine a large number of crops and to assess the degree of butterfly damage occurring. Due to the remarkable consistency and efficiency of the virus in checking the pest in each of these seasons, it can be stated without reservation that the use of insecticides for attempted control of white butterfly would have been unwarranted.

It is considered, therefore, that vigilance and observation by farmers could often relieve them of the frequent and unnecessary expense of buying insecticides to control the pest. In addition to this, their concern for the welfare of their crops would be reduced.

Parasite Control

Of the two species of parasites introduced to control the white butterfly, only one appears to exercise any control in the North Island. This parasite, *Pteromalus puparum*, attacks the pre-pupal and pupal forms of the pest. Though a high level of parasitism is attained by this parasite, at the end of the season its overall efficiency appears to be somewhat impaired by the virus.

The pest normally overwinters in the pupal form, but owing to the high level of mortality of caterpillars due to virus at the end of the season, only relatively few parasitised pupae can



Upper—Caterpillar damage to marginal part of chou moellier crop in February 1957. Lower—The same crop six weeks later, showing the rapid recovery of plants after virus had killed the caterpillar population.



be expected to overwinter. This results in an inadequate number of adult parasites hatching out at the beginning of the next season to cope with the normally more rapid development of the butterfly. This appears to reduce the effectiveness of the parasite during a considerable portion of the season, as it is not until late summer that the desired degree of control is achieved by this insect.

Reference

J. M. Kelsey, "New Zealand Journal of Agricultural Research", vol. 1, 1958, pp. 778-782.

Leaf Stripe of Sweet Corn and Maize

By I. G. FORBES,

Assistant Horticultural Superintendent, Department of Agriculture, Dunedin

L EAF stripe, a disease of sweet corn and maize caused by the fungus *Helminthosporium turcicum*, is widely distributed throughout the world. Three *Helminthosporium* diseases occur rather generally on maize and sweet corn in many parts of the world, but in New Zealand, as far as is known, only *Helminthosporium turcicum*, causing leaf stripe or northern leaf blight, as the disease is called in the United States, is of concern. In New Zealand leaf stripe is not a serious disease every year, but last season it caused severe losses to sweet corn growers in the Auckland district. It is serious in the Gisborne district in some seasons.

THE disease first appears as small, faintly yellow spots which may develop into water-soaked areas. As these spots enlarge and elongate the centres become greyish-green and later silvery. In favourable weather these elliptical lesions continue to grow; after 14 days they may be 1 to 2 in. or more long and $\frac{1}{8}$ to $\frac{1}{4}$ in. wide at the centre. With continuing favourable conditions several lesions may grow together to destroy large areas of the leaf.

The dead tissue in the centre of the lesions becomes tan with age and often bears dark spore masses, while the advancing margin is typical greyish-green. Infections occur on tender leaf tissue in the whorl and on fully expanded blades. The lesions are usually seen first on the older basal leaves. According to reports in the United States, tassel infection is less conspicuous and ear infection is rare.

Sources of Infection

The most likely source of initial infection is from spores coming from old maize or sweet corn plants nearby. The fungus can live for long periods on dead corn plants and may produce spores abundantly in wet weather. Old plantings should be ploughed under or burnt as soon as possible after harvest. This of course requires a community effort if it is to be effective. Maize used as windbreaks is a possible source of infection.

Leaf stripe is not generally regarded as a seed-borne disease, but it could be carried on maize debris with the seed or as spores on the outside of the seed. The important source of infection, however, is spores from old maize and sweet corn plants.

Occurrence

Weather conditions are clearly related to outbreaks of the disease.

Moisture is particularly important and seasons with frequent showery conditions, heavy dews, or fogs are likely to be troublesome.

Relatively cool weather accompanied by heavy dews appears to favour the development and spread of the disease. Warm, dry weather definitely checks it. In Florida leaf stripe, or northern leaf blight as it is called there, is generally regarded as a problem in cool weather, while southern leaf blight, caused by another species of *Helminthosporium*, is favoured by warm weather. However, as strains of the leaf stripe fungus have been found which flourish at relatively high temperatures, optimum temperature requirements for development of the disease are uncertain. Moisture is of prime importance, for the spores require free moisture for germination.

Control

There are three aspects to the control of leaf stripe of maize and sweet corn.

1. Hygiene and crop rotation.
2. Spraying.
3. Use of resistant varieties.

The importance of ploughing in or burning old maize and sweet corn plants after harvest has already been stressed. This is particularly important where a succession of crops is grown. Where there is a light infection and no protective sprays are applied leaf stripe can ruin a crop in a few days of wet weather. It is not good practice, for disease control, to grow successive maize or sweet corn crops on the same land.

Though leaf stripe is not regarded as a seed-borne disease, it is a wise precaution to dust the seed with an organic mercury, thiram, or dichlone seed dust before sowing.

Much experimental work has been done in other countries on spray programmes to control leaf stripe.

Zineb at 2 lb per 100 gallons is generally recommended. In Florida it is usual to begin spraying when the plants are 18 in. high and to continue at weekly intervals until harvest. There is no experimental evidence on spraying under New Zealand conditions and the time interval would no doubt depend on the weather; in wet weather or when frequent heavy dews occur it may be necessary to spray at weekly intervals or after rain.

In Florida special spray equipment has been developed consisting of a high-level, engine-propelled sprayer with two nozzles above the row and three nozzles on each dropper arm on each side of the row. In trials 250 American gallons per acre was the most effective volume of spray to apply when the crop was at full height.

The development of resistant varieties of both maize and sweet corn is a definite possibility and much work is being done in the United States and other countries to this end. None of the commercial varieties of sweet corn available at present is resistant to leaf stripe.

Bloat in Dairy Cows Can be Prevented

THOUGH bloat in ruminants is a distressing complaint which has been known for hundreds of years, the increased use of legumes as stock food in recent years is generally considered to have caused higher incidence. To dairy farmers such a trouble has considerable economic significance, as it is estimated that in New Zealand from 10,000 to 20,000 dairy cows die of bloat annually.

Because of the loss of milk production resulting from these deaths and from even mild attacks of bloat it is essential that every possible preventive and control measure be taken. Effective methods are described in a new Department of Agriculture bulletin, No. 398, "Prevention and Treatment of Bloat in Dairy Cows", by Dr A. T. Johns, Director of the Plant Chemistry Division of the Department of Scientific and Industrial Research.

This concise and handy publication is a reprint of a "Journal of Agriculture" article and describes the cause of bloat, treatment for animals suffering from it, and management methods which will prevent its occurrence.

Pasture management and the use of anti-foaming agents both orally administered and sprayed on pasture are preventive measures described. Details are given of preparation of remedies and the equipment required.

The bulletin is illustrated. It can be obtained free at all offices of the Department of Agriculture.

South African Shrubs in Flower Garden

NEW ZEALAND gardens owe a great deal of their colour, particularly in winter and spring, to South African plants. Many of our most popular bulbs—freesias, ixijs, lachenalias, and nerines, to name only a few—are South African. So, too, are a number of frequently grown annuals and perennials such as nemesias, arctotis, gerberas, agapanthus, kniphofias, and strelitzias; and among the shrubs are the spectacular proteas and leucospermums.

THE reasons for the popularity of South African shrubs are not hard to find. Most of them grow well, especially in the warmer districts, and they stand the lighter and drier soils and hot positions better than many of the earlier introductions from Europe, North America, China, and Japan. Most are tolerant of wind and seaside conditions, but it is probably their winter and early spring flowering habit which makes them so popular. Flowering in winter and early spring they are invaluable for garden decoration and many are good for cutting.

The Proteas

In their habitat most proteas grow on the mountainsides in areas where winters are wet and summers and autumns dry. Drainage is perfect, for the soil is usually sandy or gravelly with a fair amount of leaf mould.

These conditions cannot be duplicated exactly, for many of our soils are heavy and summers are frequently by no means dry, but they indicate the conditions we should try to provide for best results. Good drainage is the first essential. A very fertile soil is not required, for proteas will thrive on a soil which would not be quite good enough for most garden plants. Manures and fertilisers, especially those supplying nitrogen, are not normally required and lime must be avoided.

Shady positions or places where they get drips from overhanging trees or buildings are not suitable. An open, sunny position is ideal and they do not object to light winds, but, as their root systems are often not good, they are liable to blow over if exposed to strong winds. They should be securely staked, though this does not always prevent damage at ground level if the plant moves about and ring-barks itself.

Most species are fairly hardy and will grow in all but the coldest districts, but the flowers on some may be damaged by severe frosts. Though most people prefer the smaller and



By J. S. SAY,
Horticulturist,
Department of Agriculture,
Auckland

[Elliott]
Erica Winter Gem is one of the brightest of the winter-flowering shrubs. The flowers are red and last about three months.

P. laticolor, 5 to 8 ft, with long, slender buds opening to creamy white flowers with a pink flush

P. longiflora, erect habit and often reaches 10 to 12 ft, wide-open pink flowers

P. mellifera, 8 to 10 ft, long buds opening to cone-shaped flowers, pink shading to white and filled with nectar in autumn and spring

P. nerifolia, 6 to 8 ft, pink flowers edged with black or dark brown velvety fur in late autumn and winter

P. scolymoecephala, 4 ft, small silvery-green flowers in winter and spring

more refined flowers of other species, the King protea, *P. cynaroides*, is the most spectacular. It grows to 4 to 5 ft high with flowers 8 to 10 in. across in autumn and sometimes through to spring. The centre is silvery pink and the bracts red. The most popular and easily obtained species are:

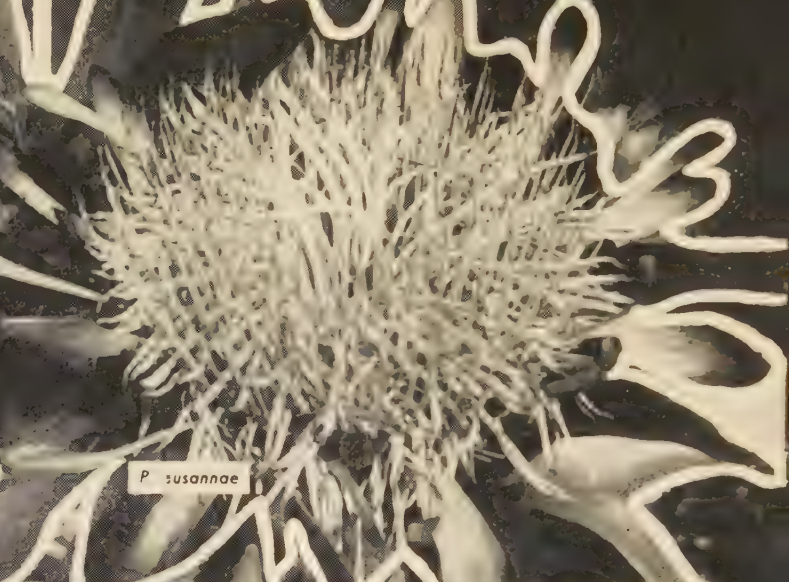


P. longiflora



P. scolymocephala

Some Popular *Protea* Species



P. susannae



P. neriifolia



P. mellifera

P. susannae, 6 to 8 ft, wide-open pink flowers in winter

P. pulchella, 4 ft, a spreading plant with pink flowers

Some species tend to become leggy, but this can be largely overcome by cutting the flowers for decorative work or when they begin to fade if they are left for garden display. They should be removed with a length of stem, but should not be cut back into old wood without leaves.

The Leucospermums

Leucospermum reflexum with its silvery-grey foliage and heads of orange-scarlet flowers is often considered the most outstanding South African shrub in gardens in the warmer parts of New Zealand. When grown as a single specimen in a suitable position it will form a dome-shaped plant 6 ft or more high covered with hundreds of flowers during late spring and early summer.

Some other recently introduced species are quickly becoming popular, but are still in short supply. *L. bolusi* grows to about 6 ft and bears apricot-coloured flowers somewhat resembling an incurved chrysanthemum in shape. *L. nutans* has reddish flowers and those of *L. tottum* are red with yellow styles protruding about an inch that give a pincushion effect. It forms a spreading bush 3 to 4 ft high. All are excellent for cutting.

Their requirements and treatment are very similar to those of proteas, to which they are closely related. An open, sunny position in a light, well drained, acid soil is ideal, but they can be grown well in heavier soils provided drainage is good.

The Ericas or Heaths

South Africa is the home of many hundreds of *Erica* species, but only a dozen or so are readily available in New Zealand. Unlike the European species they do well in the warmer parts of the country. Though they are frequently not long lived, they are well worth a place in the garden if conditions are suitable for them.

Two of the best known species flower in the winter. *E. melanthera* (syn. *E. canaliculata*), 4 ft, is smothered in small, pale mauve flowers and *Erica* Winter Cheer (*E. oatesi*), 2 to 3 ft, has large red bells and is one of the brightest of the winter flowering small shrubs. Both are slightly frost tender. Spring and summer flowering species include:

E. parkeri, 2 to 3 ft, with an upright habit and waxy, tubular, soft pink flowers

E. sessiliflora, 3 ft, an unusual plant with greenish flowers with red tipped anthers

E. cerinthoides, 1 ft, scarlet tubular flowers

E. mammosa, 4 ft, very free flowering, with masses of tubular red flowers.

E. mammosa coccinea, orange-scarlet

E. verticillata, 4 ft, purplish flowers

E. bowiciana, 4 ft, white flowers over a long period, but the main show is in summer

E. hentyana, 3 ft, pale pink

E. taxifolia, 3 ft pink

SOUTH AFRICAN SHRUBS



[Elliott]

▲ Under favourable conditions *Leucadendron argenteum* sometimes bears small, cone-shaped yellow flowers shown here surrounded by the silky, silvery leaves for which the tree is primarily grown.

← *Leucospermum reflexum* with its orange-red flowers is a most striking South African shrub.

[Elliott]



Spring and summer flowering species are moderately hardy and will stand up to 8 to 10 degrees of frost.

Ericas like an open position and a well drained soil with plenty of organic matter. They should not be given lime, as they like an acid soil. Once established they will stand fairly dry conditions in summer and autumn, but watering should not be neglected in the early stages. They are excellent for growing among azaleas, rhododendrons, and other acid-loving plants and for rock gardens.

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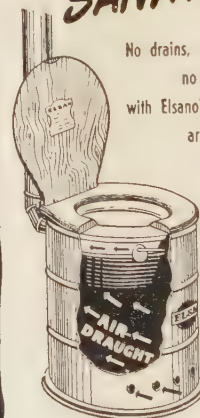
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Other Good Shrubs and Trees

The Cape Silver tree, *Leucadendron argenteum*, with its shining, silky leaves and upright habit is one of the most striking small specimen trees available. It grows to about 15 to 20 ft. It must have a well drained soil and though it is rather frost tender will stand exposed, windy positions and is particularly good for coastal planting. It is one of a very large group of which a few other species are occasionally available. Some are grown for their foliage and others for their flowers, which are something like proteas to which they are related, but are usually in shades of yellow.

The feathery, silvery-green flowers of *Phytica plumosa* are popular for cutting in winter. This little shrub will grow on almost any type of soil if well drained. It is hardy and will stand wind, but frequently is not long lived. It needs pruning to prevent it from becoming leggy and this is best done by picking the flowers.

Virgiliae are among the showiest of the late-spring and summer-flowering trees. They grow very rapidly to 20 and 30 ft and start to flower in two or three years from planting. They are sometimes not long lived, but are particularly good where a quick effect is needed. They bear masses of pinky-mauve, pea-shaped, sweet-scented flowers. The foliage is a good soft green. A shallow root system makes them liable to blow over if exposed to strong winds and they are slightly frost tender. *Virgilia capensis* (*V. oroboides*) flowers a little later than *V. divaricata* and the colour is a little lighter.

Plumbago capensis, a quick-growing scrambling shrub which is usually trained against a fence or wall, will introduce a touch of sky blue to the summer garden. It stands neglect, dryness, and all but the hardest frosts. It flowers most freely in the full sun, but is satisfactory in shade. As it suckers freely, it should not be planted where it can become a nuisance.

The tall spikes of orange flowers of *Leonotus leonorus* (lion's tail) brighten many gardens in autumn and winter. It is one of the plants which will grow almost anywhere and often thrives in hot, dry positions where most others would not be happy. Hard pruning after the main flowering will encourage new growths from the base and will help to keep the bush in better shape. *L. dysophylla* is very similar, but has larger and more showy flowers. Both will stand fairly severe frosts.

Polygala grandis and *P. virgata* are two other hardy shrubs and will do well in dry places. They have purple pea-shaped flowers for many months with the main flush in winter and early spring. Pruning after the main flowering season will help to promote a more bushy shape.

Podalyria calypttrata with pinky-mauve sweet pea flowers, *P. sericea*

SOUTH AFRICAN SHRUBS



Plumbago capensis, a scrambling shrub usually treated as a climber and trained against a wall, has blue flowers over a long season.

with small silver leaves, and *Adenandra fragrans* and *A. uniflora* with large tea tree-like flowers are other popular shrubs in the warmer districts.

So far only a comparatively few South African shrubs are in cultivation in New Zealand and gardeners can look forward to the introduction of many more very worthy species in the years to come.

Garden Work for February

Shrubs and trees which were planted last winter may not yet have developed a deep root system and are therefore likely to suffer from drought and heat in February. Many newly planted trees die every summer through lack of a little extra care and attention.



By JOY WATKINS,
Horticultural Advisory Officer,
Department of Agriculture,
Auckland

Thorough watering as necessary, followed by mulching with sawdust, leaf mould, or compost to keep the soil moist, is most beneficial. Lawn mowings can be used as a very thin mulch which is renewed frequently. A thick layer of lawn mowings forms a blanket which will not allow air to

penetrate to the soil. No mulch should touch the stem of the tree or shrub, as it would encourage such diseases as collar rot. When water is available to spray over the shrubs in the evening this will help to keep the leaves fresh.

Lawns

During periods of drought the mower blades should be raised and the grass cuttings allowed to fall back on to the lawn. Where dead patches appear due to grass grub, etc., 1 oz of 50 per cent DDT should be applied to 40 sq. yd. either alone or mixed with a fertiliser dressing.

Roses

Pruning roses hard back in early February and applying fertiliser and heavy watering toward the end of the month will provide a good display in autumn. This is particularly valuable where few blooms are produced in mid summer because of drought or heat.

Removal of dead heads should be continued in the cooler and moister parts of the country, cutting back to one or two well developed buds which will produce flowers later in the season.

Herbaceous Borders

The chief work in herbaceous borders consists of weeding and the removal of dead heads. As spring and summer plants finish flowering, they should be cut back to healthy leaves. They should not be cut down to ground level, as the plants require plenty of leaves with which to build



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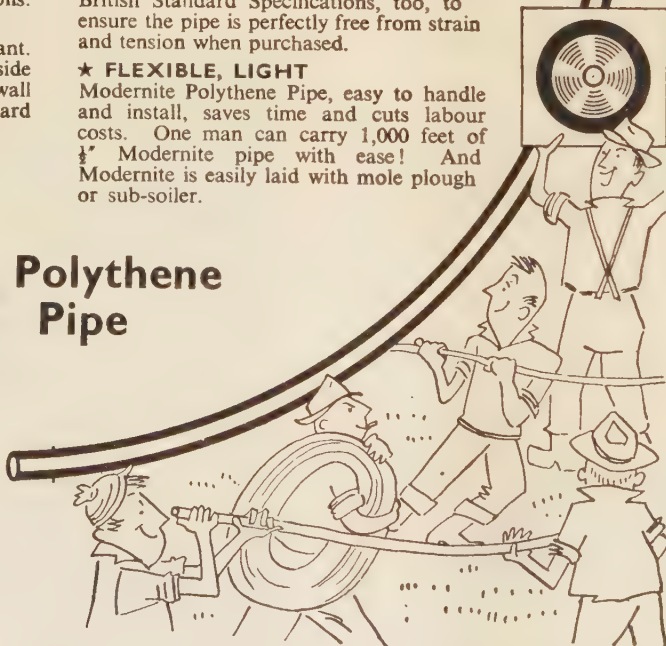
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▲ Disbudding chrysanthemums. Remove all except the terminal bud as soon as the lateral buds are large enough to handle.

← Layering carnations. Remove the lower leaves of a strong shoot, make a slanting cut upward as shown, and peg into sandy soil so that the cut remains open.

up food supplies for next year's flowers. Continue staking and tying the autumn flowering plants as necessary. Feeding and disbudding of chrysanthemums and dahlias are essential if long-stemmed blooms are required for cutting.

Glasshouses

The main difficulty in glasshouses in February is to keep plants cool and moist. Full ventilation should be given day and night and blinds, whitewash, or proprietary shading materials used. Watering and damping down may be necessary twice a day or more, usually early morning and midday. Damping down consists of spraying paths and benches so that they become thoroughly moistened. Evaporation from these surfaces lowers the temperature slightly and produces a humid atmosphere round the plants, reducing evaporation of water from the leaves (in transpiration) and thus lowering the demand for water by the roots.

If benches are covered with shingle, scoria, or similar material they will remain moist longer. Any suitable plants should be transferred to a shade house or sunk to their rims in a shady position out of doors during the hottest part of the year.

Cyclamen which have dried off can now be repotted and started into growth for winter flowering. Details of cyclamen can be found in the January 1959 issue of "The Journal".

Bulbs for winter flowering should now be planted in pots or bowls filled with bulb fibre, coarse scoria, or chip-pings and watered and placed in a cold dark place until the shoots are about 2 in. high. This provides for

the development of a good root system before any forcing takes place. In the North Island lachenalias placed five in a 5 in. pot are most successful. In the South Island hyacinths, tulips, daffodils, crocus, and many other bulbs can be grown easily.

Ground should be prepared now for planting outside and bulbs should be ordered. It is worth paying extra for top-quality, top-size bulbs if a really fine display is desired, though smaller bulbs are suitable for naturalising in grass or among shrubs.

Sowing and Propagation

Sowings of winter flowering sweet peas and Iceland poppies can now be made in the open ground. If these can be nursed through the hot weather, they will provide ample flowers for cutting and garden decoration in winter and early spring. Cyclamen can be sown under glass.

Cuttings of shrubs, including roses, should be placed in a scrim-covered frame or in a damp, shady position outside. Rooting is often accelerated by the use of hormones, and cuttings are then inserted in a pot of sandy compost and the whole placed in a polythene bag. Cuttings should be of current year's wood and firm at the base. The tips of many shrubs can be rooted in rain water to which charcoal has been added to keep it sweet.

Carnation layering is possible now. Only strong, healthy plants should be used for propagation, as many diseases of carnations can be transmitted in this way. Rooted layers or cuttings should be placed in well drained soil which has been liberally limed. If

drainage is a problem, the beds can be raised about 4 in. above the surrounding land.

Pests and Diseases

Citrus scale: Use summer oil, 1 pint to 4 gallons of water. The February application is the most important spray for scale.

Green vegetable bug and aphids: Malathion or lindane, according to manufacturers' instructions.

Diseases: Zineb, 1½ oz in 4 gallons of water at two week intervals.

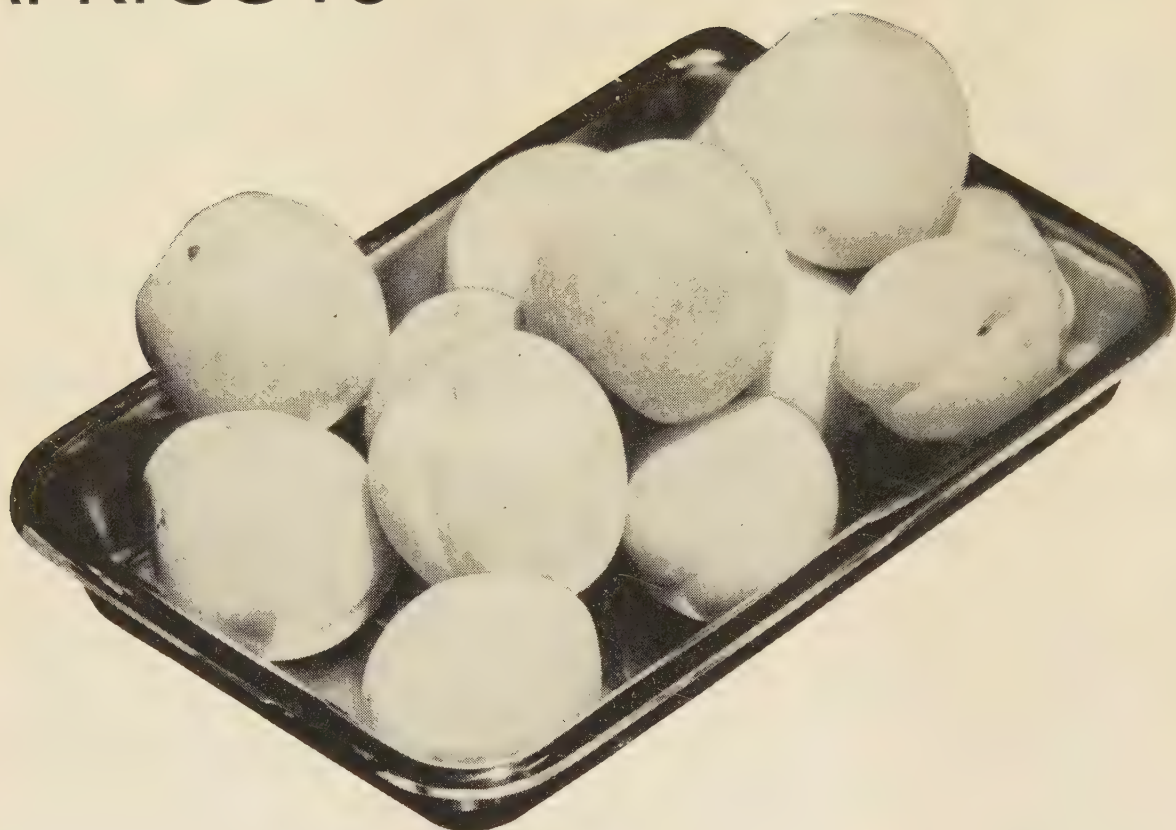
Powdery mildew: Spray with karathane at ¼ oz or colloidal sulphur (40 per cent) at 1½ oz in 4 gallons of water. Do not mix with summer oil.

Floral Decorations

The choice of material for floral decorations can be a problem in February. Doors and windows are wide open to allow air through the rooms, and this with the heat reduces the life of cut flowers considerably. Foliage of silver-leaved plants and those with thick shiny cuticles, for example, satin bush, *Senecio greyi*, lamb's ear, eucalyptus, and Mexican orange blossom, stand these conditions fairly well. With a basic arrangement of these leaves a few flowers can be added and replaced as necessary or dried flowers used.

Pastel colours will look more refreshing than flowers with warm red, yellow, and orange shades. An arrangement of iris or flax leaves and a few iris or other watery-looking flowers on a pin-holder in a shallow bowl of water looks cool and lasts well.

APRICOTS



are Popular and Versatile

APRICOTS are at their best when tree-ripened and eaten freshly picked. The flavour of the sun-warmed, golden flesh is unforgettable and makes that of case-ripened fruit pale into insignificance. It is unfortunate that because this fruit has a soft flesh, readily susceptible to brown rot and mould spoilage when ripe, orchardists have to pick and pack the fruit before it is fully ripe to ensure that it arrives in the markets in good order. Wet, humid conditions favour the growth of brown rot in the maturing fruit and so in wet seasons apricots are often in short supply and are expensive. In this article Betty M. Johnston, Home Science Instructor, Department of Agriculture, Wellington, gives recipes for cooking and preserving apricots.

APRICOTS are probably one of the most popular fruits, but because they will not keep for long after ripening, most of the crop each year is bottled or made into jam. Fortunately, apricots are easy to preserve and their attractive colour and flavour make them universally popular. One or two well tended trees in the home garden will usually yield sufficient fruit for an average family, the great

advantage of tree-ripened apricots offsetting the small amount of labour needed to keep the trees in first-class condition.

The earlier varieties mature about Christmas, the main crop ripening in the middle of January in a good season. Whenever possible, preserving fruit should be used immediately after picking to avoid loss of flavour, over-ripening, or mould damage. Jam and

cooking fruit may be kept longer, but all bad spots must be cut out before cooking.

In the recipes all measures are level, standard measures.

COLD DESSERTS

Apricot Whip

$\frac{1}{2}$ cup of apricot pulp	$1\frac{1}{2}$ cups of hot fruit juice
Or	
6 oz of dried fruit	3 oz of sugar
$1\frac{1}{2}$ tablespoons of gelatine	$1\frac{1}{2}$ tablespoons of lemon juice
$\frac{3}{4}$ cup of cold water	3 egg whites

(Six servings)

Soak the dried fruit for 24 hours in warm water before pulping it **or** cook the fresh fruit until soft and then sieve it. Soak the gelatine in the cold water. Add the hot fruit juice and half the sugar to the gelatine and stir until it has dissolved. Add the lemon juice and leave the mixture to cool. When it is beginning to set add the fruit pulp and beat until frothy.

APRICOT DESSERTS

Beat the egg whites to a soft foam, add the remaining sugar, beat thoroughly until stiff and fold into the gelatine mixture.

Serve either in individual dishes or pour into a cold wet mould. Serve with cream or a custard made with the egg yolks.

Pouring Custard

3 egg yolks
1 tablespoon of sugar
Drop of vanilla

1 pint of milk
 $\frac{1}{4}$ teaspoon of salt

Beat the egg yolks with the sugar and salt, add the milk and mix thoroughly. Heat in a double boiler, stirring constantly until it begins to thicken.

Remove from the heat and when cool add the vanilla.

Apricot Mousse

2 tablespoons of gelatine
2 tablespoons of cold water
1 cup of apricot pulp

1 cup of cream, whipped
6 oz of sugar
6 apricot slices

(Six servings)

Soak the gelatine in the cold water for five minutes. Heat over hot water, stirring until all the gelatine has dissolved. Add the melted gelatine to the apricot pulp and chill until it begins to set.

Fold in the whipped cream and the sugar. Chill until the mixture is stiff enough to hold its shape.

Pile into individual dishes and top with slices of apricot.

Apricot Ice Cream

1 lb of dried apricots
Or
2 cups of apricot pulp
8 oz of sugar
1 tablespoon of chopped ginger

Juice of half a lemon
1 small tin of evaporated, unsweetened, condensed milk
 $\frac{3}{4}$ teaspoon of gelatine
2 teaspoons of water

(Six servings)

Soak the dried apricots for 24 hours in warm water. Bring them to the boil, add the sugar and ginger, and cook until the fruit is mushy. Pulp the fruit, add the lemon juice, and cool.

Soak the gelatine in the cold water for five minutes. Heat the condensed milk. When it is hot, but not boiling, dissolve the gelatine in it. Pour the mixture into a freezer tray and chill quickly.

When icy cold whip vigorously and fold in the fruit pulp. Pour into freezer trays and freeze quickly.

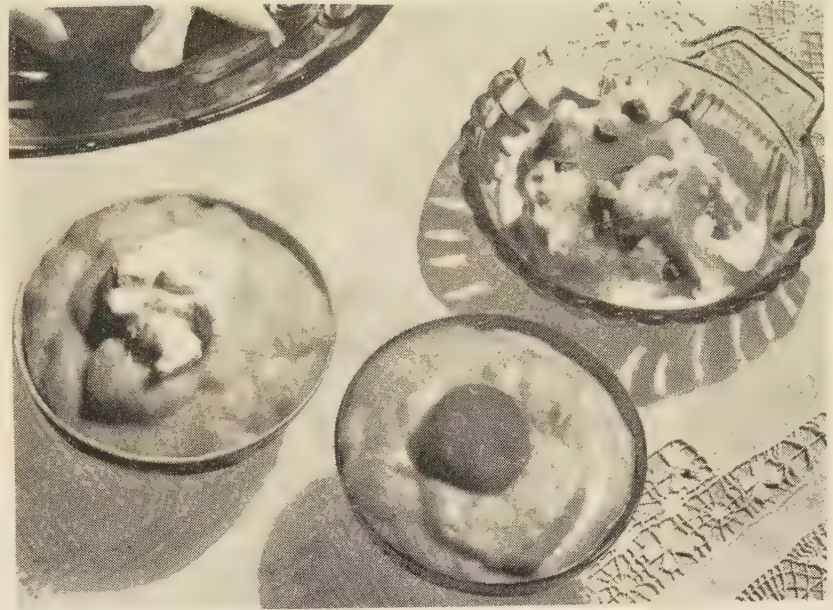
Apricot Bavarian Cream

1 $\frac{1}{2}$ tablespoons of gelatine
 $\frac{1}{2}$ cup of cold milk
3 egg yolks
 $\frac{1}{2}$ cup of sugar
 $\frac{1}{2}$ pint of cream, whipped

Pinch of salt
1 $\frac{1}{2}$ cups of scalded milk
1 cup of well mashed fresh apricot pulp

(Six servings)

Soak the gelatine in the cold milk for five minutes. Beat the egg yolks,



Apricot whip, apricot mousse, and apricot ice cream.

sugar, and salt together in the top of a double boiler. Add the scalded milk and mix thoroughly.

Cook the custard over hot water, stirring constantly until it coats a wooden spoon. Add the gelatine, stirring until dissolved and cool. When it begins to thicken, add the fresh fruit pulp and fold in the whipped cream.

Either pile into individual dishes or turn into a mould which has been rinsed with cold water. Chill until firm.

Apricot Chiffon Pie

1 cup of crumbled wine biscuits
3 tablespoons of melted butter
1 $\frac{1}{2}$ tablespoons of gelatine
1 cup of apricot pulp (fresh or cooked)

4 oz of sugar
Pinch of salt
 $\frac{1}{2}$ cup of cold water
1 egg white, stiffly beaten
1 cup of cream, whipped

(Six servings)

Mix the biscuit crumbs and melted butter, line a 9 in. pie plate, pressing the mixture firmly against the sides, and chill.

Soak the gelatine in the cold water for five minutes and dissolve it over hot water. Add the sugar to the fresh apricot pulp (omit the sugar if the fruit has been cooked and sweetened beforehand). Add the gelatine and salt to the fruit pulp, mixing well, and chill.

When it begins to set whip until light and frothy. Fold in the egg white and whipped cream. Pile into the pie shell and chill.

HOT DESSERTS

Apricot Meringue Pie

9 in. pie shell
2 cups of stewed apricots
Juice of one lemon
Rum flavouring

3 egg whites
3 measuring tablespoons of sugar
Cornflour for thickening

Pit the apricots and cook them with sugar in a small quantity of water. Thicken the juice with the cornflour to the consistency of moderately thick porridge. Add the lemon juice and flavouring. Pile the fruit and thickened juice into the pie shell.

Whip the egg whites to a stiff foam, adding the sugar a tablespoon at a time. Pile on top of the fruit.

Bake the pie in a moderate oven (350 degrees F) for 15 minutes or until the meringue is lightly browned.

Apricot Sponge

1 quart of stoned, preserved, or lightly stewed apricots

Heat the apricots and preheat the oven to 350 degrees F (moderate heat).

Sponge

$\frac{1}{2}$ lb of butter
 $\frac{1}{4}$ oz of sugar
2 eggs
6 oz of flour

1 $\frac{1}{2}$ teaspoons of baking powder
2 tablespoons of milk

Cream the butter and sugar, beat the eggs and add them one at a time. Gradually fold in the sifted flour and baking powder, alternating with the milk.

Place the heated apricots in an ovenware dish, and pour the sponge mixture on top. Cook for 30 to 40 minutes, depending on the depth of

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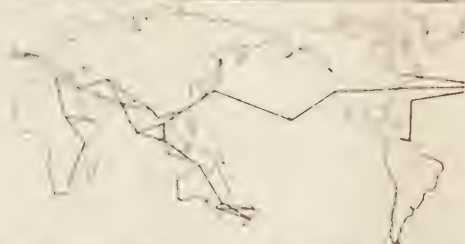
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the sponge, in a moderate oven (350 degrees F).

Apricot Shortcake

1 oz of cornflour	4 oz of sugar
7 oz of flour	1 egg
4 oz of butter	1 teaspoon of baking powder
$\frac{1}{2}$ teaspoon of salt	
1 cup of apricot pulp	

Cream the butter and sugar. Drop in the whole egg and beat thoroughly. Add the sifted flour, cornflour, salt, and baking powder.

Press half the shortcake mixture into a round flat tin and spread with the drained apricot pulp. If dried apricots are used, first soak them overnight in warm water and cook them to a soft mush the next day. A little lemon juice may be added if desired.

Shape the rest of the shortcake and place over the fruit. Bake in a quick oven (400 degrees F) for half an hour.

Serve hot with cream or a soft custard, or let it cool and pile halved apricots and whipped cream on top.

APRICOTS WITH MEAT

Apricots are an excellent accompaniment to fat meat, either as a pickle, in a salad, or baked with pork or ham. The tart flavour of the fruit tends to offset the richness of pork and ham and its bright colour adds interest to the meal.

Baked Ham with Apricots

6 $1\frac{1}{2}$ in. thick slices of ham (about 2 $\frac{1}{2}$ lb)	Halved, stoned apricots
4 tablespoons of brown sugar	1 tablespoon of cornflour
$\frac{1}{2}$ cup of pineapple juice	$\frac{1}{2}$ cup of soft, brown breadcrumbs

Melt two tablespoons of brown sugar in a heavy pan. Wipe the ham with clean cooking paper or a clean damp cloth. Place it in the pan and brown gently on both sides. Add the pineapple juice and bake in a moderate oven (350 degrees F) for about 20 minutes.

Arrange the meat and raw apricot halves on an ovenware platter and sprinkle the breadcrumbs mixed with the rest of the brown sugar over the meat and fruit. Return the dish to the oven for another 15 minutes.

Thicken the meat drippings and pineapple juice with the cornflour mixed to a smooth paste with a little cold juice.

Halved apricot kernels may be cooked with the ham to give it a nutty, almond flavour.

In Lettuce Salads

If raw apricots are used in lettuce salads, it is advisable to dip the cut surfaces in lemon or some other citrus fruit juice. This helps to prevent browning.

PRESERVING

Apricots may be preserved by the following methods:

Deep freezing

Bottling in syrup

Drying

Making into jam, jelly, juice, chutney, and pickles.

Deep Freezing

Choose only firm, clean, well ripened fruit. Overripe or bruised apricots should be discarded, or cooked for immediate use. Handle the fruit gently, as it bruises easily. Work quickly doing small lots of 2 to 3 lb at a time.

Wash the sorted fruit in cold running water to remove dust and insects. Spread the washed fruit to dry on absorbent kitchen paper or a clean tea towel.

Halve the fruit with a sharp knife and remove the stones. Pack the halves immediately into cartons lined

with moisture-proof paper or into heavy-weight plastic bags which have been previously tested for leaks by being filled with water.

Cover the fruit with a heavy syrup which can be made in quantity and stored for not more than two days in the refrigerator. A heavy syrup contains equal parts by volume of sugar and water, that is, four cups of sugar and four cups of water.

A quarter of a teaspoon of ascorbic acid (obtainable from chemists) added for each cup of syrup will help to prevent the fruit discolouring, but will add to the cost of the finished product. Add the acid just before the syrup is poured over the fruit as it deteriorates on standing.

A crumpled piece of waxed paper placed on top of the fruit will help to keep it submerged in the syrup. Fold the moisture-proof paper or the top of the plastic bag so that as much air as possible is excluded and seal. Waxed



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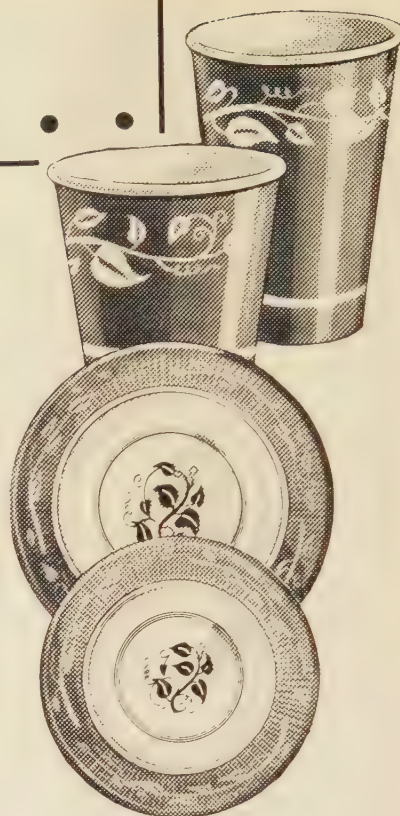
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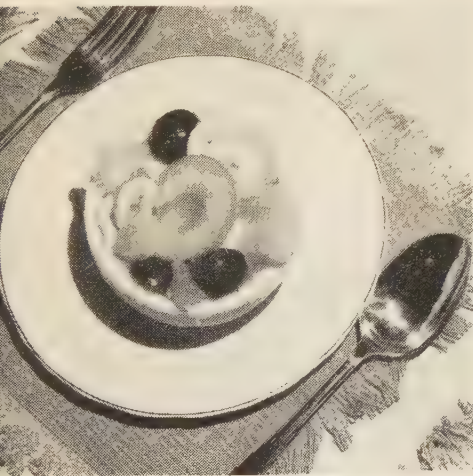


cartons or bags are sealed by covering with a layer of brown paper and running the tip of a warm iron over the fold, and plastic bags may be similarly sealed or firmly fastened with special metal clips. Cellulose tape is not always a success, as it becomes brittle in very cold temperatures and may peel off. Glass jars, unless they have been made to withstand low temperatures, may crack or break as the contents freeze. Sometimes jars which have withstood freezing break when they are removed from the freezer and are left to stand for a while to let the solidly frozen fruit thaw.

Label all the packages with the date and brief description of the contents. As each small lot is packaged, sealed, and labelled, place in the refrigerator and when all the fruit is finished place the chilled packages in the home freezer. Enter up the day's work on the inventory or working list of the freezer's contents.

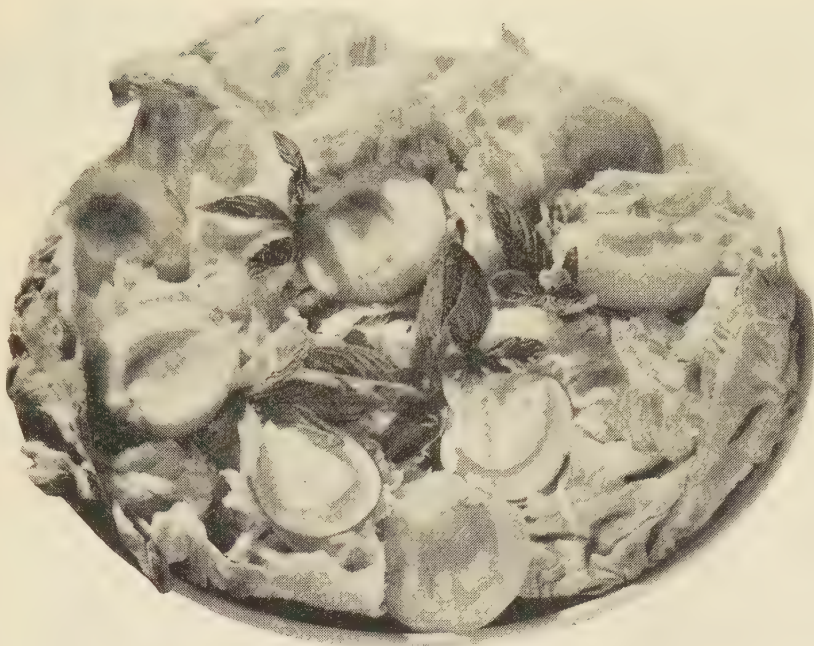
If the fruit is packed without syrup (dry packed), use one cup of sugar to four cups of halved apricots. A quarter of a teaspoon of ascorbic acid added to each cup of sugar will help to hold the colour of the fruit, but the syrup pack method is recommended for better results with apricots. The sugar should be dredged over the fruit which should be gently turned with a spoon to ensure that it is all evenly coated. Shake the container occasionally as the fruit is being packed so that the sugar is distributed through the fruit.

Thaw the frozen apricots in their packages before use.



Fruit salad can be bottled. This one is made from apricot halves, pitted cherries, sliced bananas, and orange and pineapple chunks.

PRESERVING APRICOTS



Dip cut surfaces of raw apricots in lemon juice to prevent browning. In this salad hard boiled eggs are stuffed and arranged with apricot halves on crisp lettuce leaves and garnished with sprigs of mint. Chill well before serving.

Bottling

The attractive flavour and appearance of preserved apricots and the ease with which they are bottled combine to make them probably one of the most popular and most frequently preserved fruits in this country.

Select firm, clean, well ripened fruit. Wash them under running water and drain well. With a sharp knife make a cut round the natural "equator". Grasp the apricot in the palms of both hands and gently but firmly screw the two halves in opposite directions. The fruit should come apart with ease and the stone can be easily removed with a pitter or a teaspoon. It usually takes 3 lb of well packed halved apricots to fill a quart preserving jar. If the fruit are large, 2 lb should be sufficient for a quart jar. Use a medium syrup.

The fruit may be precooked and poured while still very hot into clean hot jars or packed raw into hot jars and covered with hot syrup. If the latter method is used, stand half a dozen jars at a time in a sink full of hot water. This stops the jars from breaking when the hot syrup is poured over the fruit. Spin the jars gently to remove air bubbles.

There are three methods widely used for preserving fruit—the open kettle, water bath, and the oven method.

Open Kettle Method

This is usually successful for acid fruits provided the jars are carefully sterilised beforehand. The fruit is cooked in syrup until it is tender and is then quickly ladled into very hot, sterilised jars, which should be filled to overflowing. Wipe the jars and seal down immediately, using boiled inner seals or lids which have not been handled on their inner sides. Do not invert the jars or stand them in a draught while they are cooling.

Wipe the jars clean and label them with the date (and price of the fruit, if it was bought, as a check for next year) before storing in a cool, dark, well ventilated cupboard.

Water Bath Method

Heat sufficient water to cover the jars with at least 1 in. of water. A tightly covered boiler with a rack at the bottom is the most suitable water bath, though a copper or cut-down kerosene tin may be used.

Fill the jars, leaving $\frac{1}{2}$ in. space at the top of each. Seal the jars, screwing the band on firmly. Zinc screw lids should be screwed back half a turn to allow for expansion on heating, and Queen jars should have the top clips in position and the lower clips loose.



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Lower the jars into the hot water and bring the bath to boiling point as quickly as possible. Keep the water boiling gently during processing. Fluctuations in temperature will cause the juice to run out into the bath water.

Count the processing time from when the water begins to boil after the jars have been packed into the bath. For precooked apricots 15 minutes is sufficient and for raw pack fruit allow 25 minutes.

Oven Method

Raw pack the fruit and cover with hot syrup. Preheat the oven to 275 degrees F. Stand the jars on a low shelf in the oven, placing a meat pan on a lower shelf to catch any overflowed syrup. Do **not** seal the jars, but place a lid (**not** an inner seal) loosely over each jar. This prevents evaporation and discolouration of the fruit.

Process the apricots for one hour. Boil the inner seal lids for three minutes to sterilise them. Remove the jars a few at a time, wipe the rims with a clean boiled cloth, and, without handling the inner sides of the seals, quickly seal down the jars. Be careful to work away from cold draughts, which might make the bottles crack.

Drying

Drying fruit is one of the oldest and cheapest methods of preserving, but it is a very slow process, taking up to 24 hours to complete. If the fruit is dried in the oven, remember to plan your meals accordingly, as the oven will not be available for cooking while the fruit is drying. Care is needed in keeping the temperature (very low heat, 140 degrees F) steady; too little heat will sour the fruit and too much will toughen or scorch it.

Air must be able to circulate freely round the drying fruit and for this reason slatted oven shelves are best. Turn or stir the fruit several times while it is drying, turning the trays round at the same time. Choose a dry day for this job, as the fruit dries much more slowly in a humid atmosphere.

Sulphuring

Exposing the halved, stoned fruit in a steam of sulphur gas helps to prevent it changing colour or losing flavour. Sulphuring also helps preserve the fruit by inhibiting growth of yeasts, moulds, bacteria, and insects when it is drying and in store. Fruit processed in this way is not harmful, but it must be done outside and care taken not to breathe in the sulphur gas. Keep children and animals away while the sulphur is burning, as the gas can be dangerous.

Wash and drain the fruit. Halve and stone it. Work quickly. Place the fruit cut side up on slatted wooden trays or wooden trays with ventilation holes bored in them. Stack the trays $1\frac{1}{2}$ in. apart. For each pound of fruit

DRYING APRICOTS



▲ If the apricots are not cooked before bottling, pack the raw stoned halves into hot jars, stand the jars in warm water, and pour hot syrup over the fruit.

▼ Drying fruit is one of the cheapest methods of preserving, but is very slow.



APRICOTS . . .

place one teaspoon of powdered sulphur on a clean metal container (for example, a cigarette tin). Place the tin of sulphur on the ground either underneath the trays if there is sufficient clearance (at least 12 in.) or alongside the stacked trays.

Light the sulphur and cover both the trays and the tin with a large airtight box or packing case. The box should have all its cracks pasted over and a small opening near the bottom of one side should be made to let in sufficient air to keep the sulphur burning.

The fruit should be left two hours in the sulphur fumes and then transferred into the oven for slow drying.

Jam

Apricot jam, because of its flavour and colour, is very popular. It can be made very easily either from raw fruit in summer or dried fruit in winter.

When using **fresh fruit** wash it well, stone it, and remove any blemishes. Cut it up roughly and heat it in a pan with a little water to stop it sticking to the bottom. Apricot jam sets readily and a little extra water is sometimes an advantage. A few kernels cracked open add an almond flavour.

When the fruit is cooked to a soft mush, but still retaining its bright colour, add an equal weight of warmed sugar (it can be warmed in the oven where the clean jars should also be warming). Stir the fruit until the sugar has dissolved and boil briskly until the jam begins to thicken.

Test a little on a cold saucer and as soon as it shows a skin on the cooling surface, pour into hot jars and seal

immediately. Label the jars and store when cool.

With **dried fruit** the following method should be used:

1 lb of large dried apricots	Juice of one large lemon
8 quarts of water	1 bottle of commercial pectin (about 6 to 8 oz)
7 lb of sugar	
1 medium-sized tin of crushed pineapple (drain off the juice)	

Soak the apricots for 12 hours in sufficient of the water to cover the fruit, then cook in the rest of the water until quite soft. Cut it up roughly. Add the pineapple and reheat. Warm the sugar and add when the fruit is hot. Stir until the sugar has dissolved and add the lemon juice and pectin. Boil for two minutes, pour into hot jars, and seal immediately.

Jelly

Apricot jelly is not often made, but the same method can be used for it as for any other fruit rich in pectin and acid. If the fruit is very ripe, extra pectin will be needed.

Wash and prepare the fruit. Add enough water just to show through the top layer of fruit in the pan. Cook the fruit until it is soft and strain the pulp overnight in a jelly bag. Do not squeeze the bag.

Test the juice for pectin by mixing one tablespoon of fruit juice with one tablespoon of methylated spirit. If a solid lump of jelly results, there is sufficient pectin in the juice to make a good jelly. If not, extra pectin should be added.

If the juice has plenty of pectin, use one cup of sugar to each cup of juice. If the pectin content is rather low, use less sugar, $\frac{3}{4}$ cup to 1 cup of juice.

Heat the juice and sugar together, stirring until the sugar has dissolved. Boil briskly until a little jells when tested on a cold saucer. Bottle and cover the hot jelly with a layer of melted paraffin wax. Cover the jars with paper or cellulose film covers. Label and store when cool.

Juice

Apricot juice can be preserved very easily. Prepare the fruit as for jelly making. Heat the chopped fruit very slowly, allowing $\frac{1}{2}$ pint of water to 6 lb of prepared fruit. Crush the fruit when the juice begins to flow. Do not boil for more than one minute. This process should take about one hour for 6 lb of fruit. Drain the juice in a jelly bag overnight. Squeeze the bag next day.

Pour the juice into clean bottles and cork with new or well boiled corks. Tie them down. Process for 15 minutes in a water bath.

Chutney

Recipe 1

1 lb of ripe apricots	1 tablespoon of ground ginger
1 lb of raisins	2 teaspoons of allspice
2 medium-sized onions	1 teaspoon of cayenne pepper
1 lb of sugar	1 quart of vinegar
2 teaspoons of salt	

Mince the raisins and onions. Stone the apricots and cut them up. Mix all the ingredients and boil together for three hours, stirring occasionally to prevent the mixture sticking to the bottom of the pan. Keep the saucepan covered. Pour the chutney into sterilised jars and seal well.

Recipe 2

1 lb of dried apricots	1 tablespoon of ground ginger
1 lb of raisins	1 tablespoon of salt
4 almonds or apricot kernels	$\frac{3}{4}$ teaspoon of mustard
1 lb of brown sugar	1 quart of vinegar
1 onion	

Soak the apricots overnight in $\frac{3}{4}$ pint of warm water. Next day cook the fruit until soft. Mince the raisins, onions, and nuts and add to the cooked fruit. Add the remaining ingredients and cook until smooth and of the desired consistency (about $2\frac{1}{2}$ to 3 hours). Pour into hot, sterilised jars and seal.

Pickle

Pickled apricots can be served with cold mutton or pork.

16 oz of white (or wine) vinegar	$\frac{1}{2}$ oz of whole cloves
2 lb of white sugar	4 lb of medium-sized, firm, ripe apricots
$\frac{1}{4}$ oz of cinnamon sticks	

Boil the vinegar, sugar, cloves, and cinnamon together for 20 minutes. Wash the apricots and place a few at a time in the hot spiced syrup and cook gently until tender, but not broken. Pack into hot, sterilised jars. Cover the fruit with the syrup and seal the jars immediately. A thick plastic skin is the best cover, as the vinegar may corrode a metal seal.

Waxed Thread for Sewing on Buttons

BUTTONS can be securely sewn on to heavy coats and overcoats if the thread is waxed. Two lengths of thread can be used if a particularly lasting result is wanted.

Thread a needle to the middle point of a length of thread. Draw the double thread which hangs from the needle firmly through a piece of beeswax and immediately rub it between the palms of the hands. This makes it into a single thread impregnated with wax and considerably strengthens its resistance to friction so that it will last much longer than would the unwaxed double thread.

When hand sewing with mercerised cotton waxing the thread lightly will prevent it from tangling and knotting.

—MAUD B. STRAIN,

Home Science Instructor,
Department of Agriculture,
Dunedin



Screw bands must be removed before pickled apricots are stored, as the vinegar may corrode the metal and cause the bands to stick.

Child's Seamless Classic Cardigan

THE average small boy likes his clothes to be comfortable and to allow of free movement, and the cardigan illustrated and for which knitting instructions are given here possesses these assets as well as providing warmth.

ABBREVIATIONS: K., knit; p., purl; st., stitch; st.st., stocking stitch (1 row k., 1 row p. or every round k.); cont., continue; beg., beginning; rem., remain(ing); tog., together; dec., decrease; sl., slip; p.s.s.o., pass slipped stitch over.

Materials: 5 oz of 3-ply wool; 2 No. 11 and 2 No. 13 knitting needles; 4 No. 11 and 4 No. 13 knitting needles for sleeves; 3 short No. 13 needles for front borders; 5 buttons.

Measurements: Length, 15 in.; chest, 26 in.; sleeve, 12½ in. (from end of gusset).

Tension: 8 st. to 1 in.

Pocket Linings

Using 2 No. 13 needles cast on 30 st. and work in k. 1, p. 1 rib for 3½ in. Leave st. on a spare needle and work a second piece in same way. Now begin at lower edge.

Using 2 No. 13 needles cast on 225 st.

1st row: * K. 1, p. 1. Rep. from * to last st., k. 1.

2nd row: * P. 1, k. 1. Rep. from * to last st., p. 1.

Rep. these 2 rows until work measures ¼ in., ending with a first row.

Next row: Rib 5, cast off 2 st., rib to end.

Next row: Rib to the last 5 st., cast on 2, rib 5 (this completes a buttonhole).

Cont. in rib, making 2 more buttonholes at intervals of 1½ in. from previous one, until work measures 3½ in., ending with a second row of rib.

Next row: Rib 24, cast off next 30 st., rib to the last 55 st., cast off next 30 st., rib to end.

Next row: Rib 25, work in rib across st. of one pocket lining, rib to the last 24 st., work in rib across st. of second pocket lining, rib to end.

Next row: Rib 12, change to a No. 11 needle, k. 2 tog., k. to the last 12 st., change to a short No. 13 needle, and rib to end.

Keeping 12 st. at each end of rows on No. 13 needles throughout, cont. in st.st. with No. 11 needles for main part, making 2 more buttonholes in left front border, at intervals of 2½ in. (measured over st.st.), then cont. until work measures 8½ in. from cast-on edge, ending with a p. row.



Shaping the Fronts

Next row: Rib 12, k. 2 tog., k. to the last 14 st., k. 2 tog., rib 12.

Work 6 rows straight.

Next row: Rib 12, p. 2 tog., rib to the last 14 st., p. 2 tog., rib 12.

Next row: Rib 12, k. 38, turn and work on these st. only, leaving other st. on a spare needle.

Cont. on these 50 st. for right front thus:

Cont. in st.st. and rib, dec. 1 st. inside front border in sixth and every following seventh row until 42 st. rem., then cont. straight until work measures 15 in. from cast-on edge, ending at front edge.

Next row: Rib 12, turn and work a further 1¼ in. on these 12 st. only.

Leave all st. on a spare needle.

Return to main st., slip the first 16 st. on to a safety pin, rejoin wool, k. 88 st., turn.

Work in st.st. on these st. for back until work measures 15 in., ending with a p. row.

Next row: K. 30, cast off next 28 st., k. to end.

Leave the 2 sets of 30 st. on a spare needle.

Return to rem. st., slip next 16 st. on to a safety pin, rejoin wool and k. to the last 12 st., change to No. 13 needle, and rib 12. Now work on these st. for left front to match right front.

Place corresponding shoulder st. tog. and graft or cast off st. tog. Graft or cast off the 2 sets of neck band st. tog.

The Sleeves

Using 4 No. 11 needles and with right side of the work facing, slip 16 st. at under-arm on to a needle, then pick up and k. 88 st. evenly round armhole edge (44 st. each side of shoulder), then k. 8 st. at under-arm on to end of third needle, thus making

centre of under-arm st. beg. and end of round.

1st round: K. 7, k. 2 tog., k. 53, turn.

2nd round: P. 20, turn.

3rd round: K. 24, turn.

4th round: P. 28, turn.

Cont. in this way, taking up 4 st. more in every row until 14 rows of shaping have been worked, ending with the row p. 68, turn.

Next round: K. these 68 st., then k. 9, sl. 1, k. 1, p.s.s.o., k. 7.

Cont. in rounds, shaping under-arm gusset thus:

1st round: K. 6, k. 2 tog., k. to the last 8 st., sl. 1, k. 1, p.s.s.o., k. 6.

2nd round: K. 5, k. 2 tog., k. to the last 7 st., sl. 1, k. 1, p.s.s.o., k. 5.

3rd round: K. 4, k. 2 tog., k. to the last 6 st., sl. 1, k. 1, p.s.s.o., k. 4.

4th round: K. 3, k. 2 tog., k. to the last 5 st., sl. 1, k. 1, p.s.s.o., k. 3.

Cont. thus, working 1 st. less at each end of round between shaping until all under-arm st. are dec., last round being k. 2 tog., k. to the last 2 st., sl. 1, k. 1, p.s.s.o.

Cont. in rounds of st.st., dec. 1 st. at beg. and end of every following fifth round until 56 st. rem. Cont. straight until work measures 10 in. from end of under-arm gusset shaping, finishing at end of round.

Change to No. 13 needles and work in rounds of k. 1, p. 1 rib for 2½ in.

Cast off loosely in rib.

To Make up

Press work lightly with a hot iron and damp cloth.

Sew neck band along back neck edge. Sew down pocket linings neatly on wrong side. Sew on buttons to match buttonholes.

Glazes for Pastries

A GLOSSY surface on some foods can turn an everyday dish into party fare and improve both appearance and flavour. Glazes are not difficult or expensive to make and are quick and easy to apply.

The most commonly used ingredients for glazes are eggs, milk, and sugar; for glazing fruits arrowroot or cornflour is used.

Sugar and Water Glaze

Dissolve a dessertspoon of sugar in the same amount of hot water. This glaze is suitable for yeast buns and is brushed over the buns as soon as they come out of the oven.

Egg and Milk Glaze

Egg and milk beaten together make a suitable glaze for pastries and pies. It should be brushed over the pastry before cooking. If the pie is a sweet one, sugar may be added.

Egg Yolk and Water

These, beaten together and brushed over the pastry before cooking, make a suitable glaze for savoury dishes.

Egg White and Sugar

These, beaten together and brushed on before cooking, are another variation for glazing sweet pies or buns.

Concentrated Syrup

A glaze for open fruit flans can consist of a concentrated syrup made from fruit juice and sugar. Boil together a cup of sugar to a cup of fruit juice until the syrup is thick enough to coat the back of a spoon; or a slightly less sweet glaze can be made by heating a cup of strained fruit juice and adding to it a teaspoonful of arrowroot or cornflour which has been mixed to a smooth paste with a little of the cold juice. Stir until the mixture has thickened slightly, making sure that there are no lumps. The addition of a tablespoon of lemon juice improves the flavour, and colouring may be added as desired.

Either of these glazes may be poured or spooned carefully over tastefully arranged fruit in an open flan case.

—ELEANOR S. CAMPBELL,
formerly Home Science Instructor,
Department of Agriculture,
Auckland

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Cleaning Rugs and Carpets at Home



HOME cleaning of carpets and rugs is usually to remove surface grime and to brighten dulled colours; anything more serious than this, especially with a large rug or carpet, is better dealt with by professional cleaners. However, for those who do attempt to shampoo their carpets at home, here is a word of warning:

Do not let them become too wet.

If too much water is used, the rug backing will become wet with a resulting brown stain on the surface. This staining is caused by soluble impurities from the rug backing rising to the surface of the tufts as the water evaporates.

Before shampooing rugs or carpets remove all dust from both the right and wrong sides with a vacuum cleaner. Sponge off grease spots with some suitable solvent such as carbon tetrachloride.

Then make a foam by either of these two methods: Dissolve one cup of mild soap flakes in four cups of boiling water and when the mixture is cool

and jellied beat it with an egg beater until a stiff, dry lather is obtained; or add one cup of mild detergent to two cups of hot water and beat it to a stiff foam with an egg beater. Frequent rebeating is necessary with the detergent lather, because it disappears rapidly.

With a soft brush or cloth apply a little of the lather to a small area of the rug. Use a circular motion and keep a good lather on the surface.

Wipe off the surface lather with a spatula. To remove the remaining lather wipe the rug with a clean cloth wrung dry out of warm water.

When detergent is used there is little or no remaining lather.

It is advisable to have two bowls of rinsing water and to repeat the rinsing two or three times. Change the water as soon as it begins to look dirty.

At no time should the back of the rug feel wet.

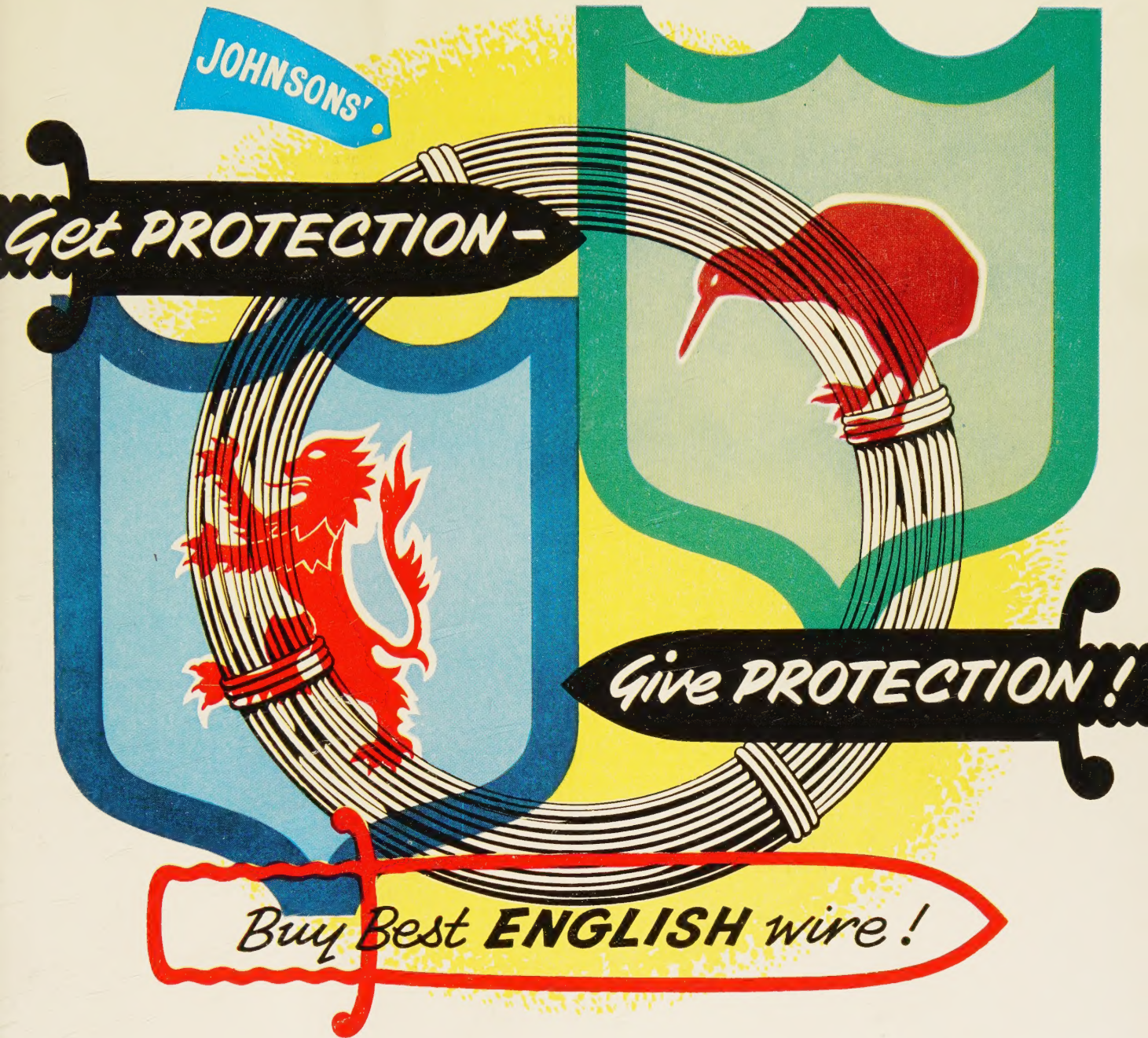
Apply the lather to another small area overlapping the edge of the first area.

After the whole rug has been cleaned smooth the nap in one direction with a slightly dampened cloth or brush.

The rug should be dried thoroughly before it is in use again and if there are any doubts about its dryness, paper should be placed under the castors of furniture to prevent rust marks.

—MAUD B. STRAIN,

Home Science Instructor,
Department of Agriculture,
Dunedin



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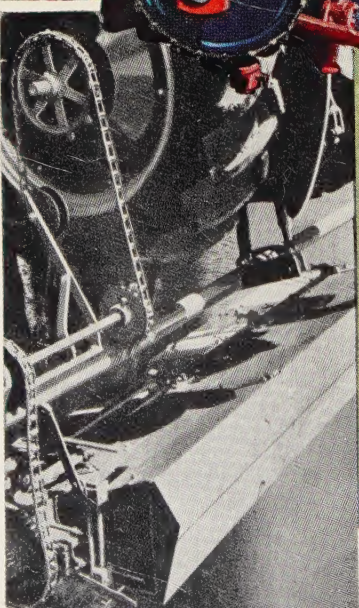
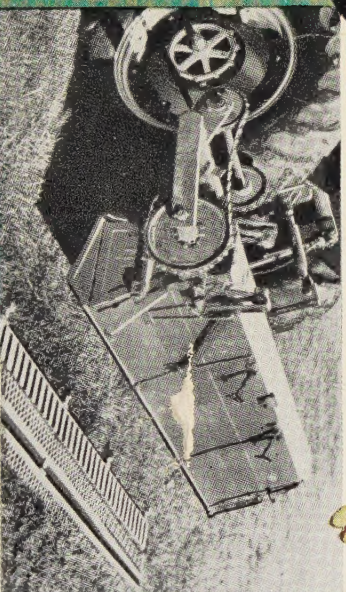
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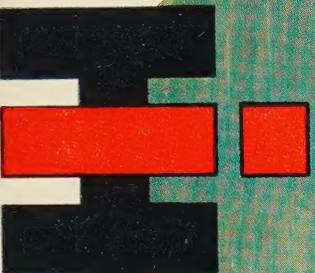


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